Registration form

WATERBORNE DISEASES $250.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $50.00

Start and Finish Dates: _____
You will have 90 days from this date in order to complete this course

List number of hours worked on assignment must match State Requirement. _____

Name_____Signature_____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

Address_____

City_____State_____Zip_____

Email_____ Fax (_____) _____

Phone:
Home (_____) _____ Work (_____) _____

Operator ID #_____Exp. Date_____

Class/Grade_____
Your certificate will be emailed to you in about two weeks.

Please circle/check which certification you are applying the course CEU's.
Water Treatment ___ Water Distribution ___ Other _____

Lab Analyst____ Wastewater Treatment____

Technical Learning College PO Box 3060, Chino Valley, AZ 86323
Toll Free (866) 557-1746 Fax (928) 272-0747 e-mail info@tlch2o.com

If you've paid on the Internet, please write your Customer#_____

Please invoice me, my PO#_____

Please pay with your credit card on our website under Bookstore or Buy Now. Or call us and provide your credit card information.

We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.

DISCLAIMER NOTICE

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

Professional Engineers; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

You can obtain a printed version of the course manual from TLC for an additional $79.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you…

Do not solely depend on TLC's Approval list for it may be outdated.

Some States and many employers require the final exam to be proctored.
http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf

All downloads are electronically tracked and monitored for security purposes.

For Texas TCEQ Wastewater Licensed Operators Important Information

Wastewater/Collections Rule Changes (Texas Only)

Rule Changes and Updates for Domestic Wastewater Systems
On Nov. 4, 2014, TCEQ commissioners adopted revisions to 30 Texas Administrative Code (TAC), Chapter 217, Design Criteria for Domestic Wastewater Systems, and "re-adopted" previously repealed rules in 30 TAC, Chapter 317, Design Criteria Prior to 2008.

Some of the changes to Chapter 217 include:

- Adding new definitions and clarifying existing definitions;
- Adding design criteria and approval requirements for rehabilitation of existing infrastructure;
- Adding design criteria for new technologies, including cloth filters and air lift pumps;
- Making changes to reflect modern practices, standards and trends;
- Modifying rule language to improve readability and enforceability; and
- Modifying the design organic loadings and flows for a new wastewater treatment facility.

SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS §§217.1 - 217.18
Effective December 4, 2015 §217.1. Applicability. (a) Applicability. (1) This chapter applies to the design, operation, and maintenance of: (A) domestic wastewater treatment facilities that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (B) treatment units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (C) collection systems that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (D) collection system units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (E) existing domestic wastewater treatment facilities that do not have a current Texas Pollutant Discharge Elimination System permit or a Texas Land Application Permit and are required to have an active wastewater permit; (F) existing wastewater treatment facilities and collection systems that never received approval for plans and specifications from the executive director; and (G) collection system rehabilitation projects covered in §217.56(c) and §217.69 of this title (relating to Trenchless Pipe Installation; and Maintenance, Inspection, and Rehabilitation of the Collection System). (2) Domestic wastewater treatment facilities, treatment units, collection systems, and collection system units with plans and specifications approved by the executive director that were received on or after August 28, 2008 and before the effective date of this chapter must comply with the rules in this chapter, as they existed immediately before the effective date of the amendments to this chapter.

The rules in Texas Commission on Environmental Quality Page 2 Chapter 217 - Design Criteria for Domestic Wastewater Systems effect immediately before the effective date of the amendments to this chapter are continued in effect for that purpose. (3) This chapter does not apply to: (A) the design, installation, operation, or maintenance of domestic wastewater treatment facilities, treatment units, collection systems, or collection system units with plans and specifications that were approved by the executive director on or before August 27, 2008, which are governed by Chapter 317 of this title (relating to Design Criteria Prior to 2008) or design

criteria that preceded Chapter 317 of this title; and (B) systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities); or collection systems or wastewater treatment facilities that collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater, although the wastewater may contain domestic wastewater.
(b) The executive director may grant variances from new requirements added by the amendments of this chapter to a person who proposes to construct, alter, or re-rate a collection system or wastewater treatment facility if the plans and specifications for the project are submitted within 180 days after the date the amendments to this chapter are effective, provided the plans and specifications comply with the rules in effect immediately prior to the amendment.
Adopted November 4, 2015 Effective December 4, 2015

The link to the rules is available on the TCEQ website at
https://www.tceq.texas.gov/rules/indxpdf.html

For Texas Students Only….

Please sign and date this notice

Printed Name

_____

Signature Date

_____

Texas Students Only

Acknowledgement of Notice of Potential Ineligibility for License

You are required to sign and return to TLC or your credit will not be reported.

Name: _____

Date of Birth: _____

Email Address: _____

By signing this form, I acknowledge that Technical Learning College notified me of the following:

- the potential ineligibility of an individual who has been convicted of an offense to be issued an occupational license by the Texas Commission on Environmental Quality (TCEQ) upon completion of the educational program;
- the current TCEQ Criminal Conviction Guidelines for Occupational Licensing, which describes the process by which the TCEQ's Executive Director determines whether a criminal conviction:
- renders a prospective applicant an unsuitable candidate for an occupational license;
- warrants the denial of a renewal application for an existing license; or
- warrants revocation or suspension of a license previously granted.
- the right to request a criminal history evaluation from the TCEQ under Texas Occupations Code Section 53.102; and
- that the TCEQ may consider an individual to have been convicted of an offense for the purpose of denying, suspending or revoking a license under circumstances described in Title 30 Texas Administrative Code Section 30.33.

Enrollee Signature: _____ Date: _____

Name of Training Provider/Organization: Technical Learning College

Contact Person: Melissa Durbin Role/Title: Dean

Waterborne Diseases Answer Key

Name_____ Phone _____

You are solely responsible in ensuring that this course is accepted for credit by your State. <u>No refunds</u>. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section
Do not solely depend on TLC's Approval list for it may be outdated.

Website ___ Telephone Call___ Email____ Spoke to_____

What is the course approval number, if applicable? _____

PA DEP Students are required to complete the original version of the text. _____
Please initial

You can use Adobe Acrobat DC Program to complete the assignment.

Please Circle, Bold, Underline or X, one answer per question.

1. A B C D E F	21. A B C D E F	41. A B C D E F
2. A B C D E F	22. A B C D E F	42. A B C D E F
3. A B C D E F	23. A B C D E F	43. A B C D E F
4. A B C D E F	24. A B C D E F	44. A B C D E F
5. A B C D E F	25. A B C D E F	45. A B C D E F
6. A B C D E F	26. A B C D E F	46. A B C D E F
7. A B C D E F	27. A B C D E F	47. A B C D E F
8. A B C D E F	28. A B C D E F	48. A B C D E F
9. A B C D E F	29. A B C D E F	49. A B C D E F
10. A B C D E F	30. A B C D E F	50. A B C D E F
11. A B C D E F	31. A B C D E F	51. A B C D E F
12. A B C D E F	32. A B C D E F	52. A B C D E F
13. A B C D E F	33. A B C D E F	53. A B C D E F
14. A B C D E F	34. A B C D E F	54. A B C D E F
15. A B C D E F	35. A B C D E F	55. A B C D E F
16. A B C D E F	36. A B C D E F	56. A B C D E F
17. A B C D E F	37. A B C D E F	57. A B C D E F
18. A B C D E F	38. A B C D E F	58. A B C D E F
19. A B C D E F	39. A B C D E F	59. A B C D E F
20. A B C D E F	40. A B C D E F	60. A B C D E F

61. A B C D E F
62. A B C D E F
63. A B C D E F
64. A B C D E F
65. A B C D E F
66. A B C D E F
67. A B C D E F
68. A B C D E F
69. A B C D E F
70. A B C D E F
71. A B C D E F
72. A B C D E F
73. A B C D E F
74. A B C D E F
75. A B C D E F
76. A B C D E F
77. A B C D E F
78. A B C D E F
79. A B C D E F
80. A B C D E F
81. A B C D E F
82. A B C D E F
83. A B C D E F
84. A B C D E F
85. A B C D E F
86. A B C D E F
87. A B C D E F
88. A B C D E F
89. A B C D E F
90. A B C D E F
91. A B C D E F
92. A B C D E F
93. A B C D E F
94. A B C D E F
95. A B C D E F
96. A B C D E F
97. A B C D E F
98. A B C D E F
99. A B C D E F
100. A B C D E F
101. A B C D E F
102. A B C D E F
103. A B C D E F
104. A B C D E F
105. A B C D E F
106. A B C D E F
107. A B C D E F
108. A B C D E F
109. A B C D E F
110. A B C D E F
111. A B C D E F
112. A B C D E F
113. A B C D E F
114. A B C D E F
115. A B C D E F
116. A B C D E F
117. A B C D E F
118. A B C D E F
119. A B C D E F
120. A B C D E F
121. A B C D E F
122. A B C D E F
123. A B C D E F
124. A B C D E F
125. A B C D E F
126. A B C D E F
127. A B C D E F
128. A B C D E F
129. A B C D E F
130. A B C D E F
131. A B C D E F
132. A B C D E F
133. A B C D E F
134. A B C D E F
135. A B C D E F
136. A B C D E F
137. A B C D E F
138. A B C D E F
139. A B C D E F
140. A B C D E F
141. A B C D E F
142. A B C D E F
143. A B C D E F
144. A B C D E F
145. A B C D E F
146. A B C D E F
147. A B C D E F
148. A B C D E F
149. A B C D E F
150. A B C D E F
151. A B C D E F
152. A B C D E F
153. A B C D E F
154. A B C D E F
155. A B C D E F
156. A B C D E F
157. A B C D E F
158. A B C D E F
159. A B C D E F
160. A B C D E F
161. A B C D E F
162. A B C D E F
163. A B C D E F
164. A B C D E F
165. A B C D E F
166. A B C D E F
167. A B C D E F
168. A B C D E F
169. A B C D E F
170. A B C D E F
171. A B C D E F
172. A B C D E F
173. A B C D E F
174. A B C D E F

175. A B C D E F
176. A B C D E F
177. A B C D E F
178. A B C D E F
179. A B C D E F
180. A B C D E F
181. A B C D E F
182. A B C D E F
183. A B C D E F
184. A B C D E F
185. A B C D E F
186. A B C D E F
187. A B C D E F
188. A B C D E F
189. A B C D E F
190. A B C D E F
191. A B C D E F
192. A B C D E F
193. A B C D E F
194. A B C D E F
195. A B C D E F
196. A B C D E F
197. A B C D E F
198. A B C D E F
199. A B C D E F
200. A B C D E F
201. A B C D E F
202. A B C D E F
203. A B C D E F
204. A B C D E F
205. A B C D E F
206. A B C D E F
207. A B C D E F
208. A B C D E F
209. A B C D E F
210. A B C D E F
211. A B C D E F
212. A B C D E F
213. A B C D E F
214. A B C D E F
215. A B C D E F
216. A B C D E F
217. A B C D E F
218. A B C D E F
219. A B C D E F
220. A B C D E F
221. A B C D E F
222. A B C D E F
223. A B C D E F
224. A B C D E F
225. A B C D E F
226. A B C D E F
227. A B C D E F
228. A B C D E F
229. A B C D E F
230. A B C D E F
231. A B C D E F
232. A B C D E F
233. A B C D E F
234. A B C D E F
235. A B C D E F
236. A B C D E F
237. A B C D E F
238. A B C D E F
239. A B C D E F
240. A B C D E F
241. A B C D E F
242. A B C D E F
243. A B C D E F
244. A B C D E F
245. A B C D E F
246. A B C D E F
247. A B C D E F
248. A B C D E F
249. A B C D E F
250. A B C D E F
251. A B C D E F
252. A B C D E F
253. A B C D E F
254. A B C D E F
255. A B C D E F
256. A B C D E F
257. A B C D E F
258. A B C D E F
259. A B C D E F
260. A B C D E F
261. A B C D E F
262. A B C D E F
263. A B C D E F
264. A B C D E F
265. A B C D E F
266. A B C D E F
267. A B C D E F
268. A B C D E F
269. A B C D E F
270. A B C D E F
271. A B C D E F
272. A B C D E F
273. A B C D E F
274. A B C D E F
275. A B C D E F
276. A B C D E F
277. A B C D E F
278. A B C D E F
279. A B C D E F
280. A B C D E F
281. A B C D E F
282. A B C D E F
283. A B C D E F
284. A B C D E F
285. A B C D E F
286. A B C D E F
287. A B C D E F
288. A B C D E F

289. A B C D E F
290. A B C D E F
291. A B C D E F
292. A B C D E F
293. A B C D E F
294. A B C D E F
295. A B C D E F
296. A B C D E F
297. A B C D E F
298. A B C D E F
299. A B C D E F
300. A B C D E F
301. A B C D E F
302. A B C D E F
303. A B C D E F
304. A B C D E F
305. A B C D E F
306. A B C D E F
307. A B C D E F
308. A B C D E F
309. A B C D E F
310. A B C D E F
311. A B C D E F
312. A B C D E F
313. A B C D E F
314. A B C D E F
315. A B C D E F
316. A B C D E F
317. A B C D E F
318. A B C D E F
319. A B C D E F
320. A B C D E F
321. A B C D E F
322. A B C D E F
323. A B C D E F
324. A B C D E F
325. A B C D E F
326. A B C D E F
327. A B C D E F
328. A B C D E F
329. A B C D E F
330. A B C D E F
331. A B C D E F
332. A B C D E F
333. A B C D E F
334. A B C D E F
335. A B C D E F
336. A B C D E F
337. A B C D E F
338. A B C D E F
339. A B C D E F
340. A B C D E F
341. A B C D E F
342. A B C D E F
343. A B C D E F
344. A B C D E F
345. A B C D E F
346. A B C D E F
347. A B C D E F
348. A B C D E F
349. A B C D E F
350. A B C D E F
351. A B C D E F
352. A B C D E F
353. A B C D E F
354. A B C D E F
355. A B C D E F
356. A B C D E F
357. A B C D E F
358. A B C D E F
359. A B C D E F
360. A B C D E F
361. A B C D E F
362. A B C D E F
363. A B C D E F
364. A B C D E F
365. A B C D E F
366. A B C D E F
367. A B C D E F
368. A B C D E F
369. A B C D E F
370. A B C D E F
371. A B C D E F
372. A B C D E F
373. A B C D E F
374. A B C D E F
375. A B C D E F
376. A B C D E F
377. A B C D E F
378. A B C D E F
379. A B C D E F
380. A B C D E F
381. A B C D E F
382. A B C D E F
383. A B C D E F
384. A B C D E F
385. A B C D E F
386. A B C D E F
387. A B C D E F
388. A B C D E F
389. A B C D E F
390. A B C D E F
391. A B C D E F
392. A B C D E F
393. A B C D E F
394. A B C D E F
395. A B C D E F
396. A B C D E F
397. A B C D E F
398. A B C D E F
399. A B C D E F
400. A B C D E F
401. A B C D E F
402. A B C D E F

403. A B C D E F
404. A B C D E F
405. A B C D E F
406. A B C D E F
407. A B C D E F
408. A B C D E F
409. A B C D E F
410. A B C D E F
411. A B C D E F
412. A B C D E F
413. A B C D E F
414. A B C D E F
415. A B C D E F
416. A B C D E F
417. A B C D E F
418. A B C D E F
419. A B C D E F
420. A B C D E F
421. A B C D E F
422. A B C D E F
423. A B C D E F
424. A B C D E F
425. A B C D E F
426. A B C D E F
427. A B C D E F
428. A B C D E F
429. A B C D E F
430. A B C D E F
431. A B C D E F
432. A B C D E F
433. A B C D E F
434. A B C D E F
435. A B C D E F
436. A B C D E F
437. A B C D E F
438. A B C D E F
439. A B C D E F
440. A B C D E F
441. A B C D E F
442. A B C D E F
443. A B C D E F
444. A B C D E F
445. A B C D E F
446. A B C D E F
447. A B C D E F
448. A B C D E F
449. A B C D E F
450. A B C D E F
451. A B C D E F
452. A B C D E F
453. A B C D E F
454. A B C D E F
455. A B C D E F
456. A B C D E F
457. A B C D E F
458. A B C D E F
459. A B C D E F
460. A B C D E F
461. A B C D E F
462. A B C D E F
463. A B C D E F
464. A B C D E F
465. A B C D E F
466. A B C D E F
467. A B C D E F
468. A B C D E F
469. A B C D E F
470. A B C D E F
471. A B C D E F
472. A B C D E F
473. A B C D E F
474. A B C D E F
475. A B C D E F
476. A B C D E F
477. A B C D E F
478. A B C D E F
479. A B C D E F
480. A B C D E F
481. A B C D E F
482. A B C D E F
483. A B C D E F
484. A B C D E F
485. A B C D E F
486. A B C D E F
487. A B C D E F
488. A B C D E F
489. A B C D E F
490. A B C D E F
491. A B C D E F
492. A B C D E F
493. A B C D E F
494. A B C D E F
495. A B C D E F
496. A B C D E F
497. A B C D E F
498. A B C D E F
499. A B C D E F
500. A B C D E F

This course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water / sampling procedures/safety/ environmental / building regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be in full-compliance and do not follow this course for proper compliance.

Please fax the answer key to
TLC Western Campus

Fax (928) 272-0747

Always call us after faxing the paperwork to ensure that we have received it.

Please e-mail or fax this survey along with your final exam

WATERBORNE DISEASES CEU COURSE
CUSTOMER SERVICE RESPONSE CARD

NAME: _____

E-
MAIL_____PHONE_____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

_____

_____

How about the price of the course?

Poor_____ Fair ____ Average ____ Good____ Great_____

How was your customer service?

Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.

_____

_____

Please fax or e-mail the answer key to TLC
Western Campus Fax (928) 272-0747.

Rush Grading Service
If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of $50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

WATERBORNE DISEASES CEU Training Course Assignment

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e- mail it back to TLC.

You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your Answer Key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular**. **Multiple Choice Section. One answer per question and please use the answer key**

Bacteriological Monitoring Section – Chapter 1
Revised Total Coliform Rule (RTCR)

1. The Revised Total Coliform Rule (RTCR) is the revision to the 1989 Total Coliform Rule (TCR).
A. True B. False

2. The RTCR requires public water systems to meet a legal limit for E. coli, and to demonstrate compliance by required monitoring.
A. True B. False

3. The frequency and timing of required microbial testing is based on population served, public water system type, and the source water type.
A. True B. False

4. The RTCR applies to all Public Water Systems, including CWSs, NTNCWSs, and TNCWSs.
A. True B. False

5. The EPA published the RTCR in the Federal Register on February 23, 1989.
A. True B. False

6. The RTCR requires public water systems to identify and fix problems that make them vulnerable to microbial contamination.
A. True B. False

7. The RTCR does not include criteria for systems to qualify for and stay on reduced monitoring.
A. True B. False

8. The MCLG for E. coli is zero, and the MCL is based on a condition that includes routine and repeat samples.
A. True B. False

9. If a specified frequency of total coliform occurrence is exceeded, PWSs must conduct a Level 1 or Level 2 assessment of their system.
A. True B. False

10. The PWSs doesn't necessarily have to correct sanitary defects identified during an assessment.
A. True B. False

Related Microbes

11. Coliform bacteria are common in the environment and are always harmful.
A. True B. False

12. The presence of coliform bacteria in drinking water indicates that the water may be contaminated with germs that can cause disease.
A. True B. False

13. The presence of _____ bacteria indicates that the water may be contaminated with fecal matter from humans or animals.
A. Fecal Coliform and E coli
B. Protozoa
C. Thermophilic
D. Bac-T
E. Coliforinia bacteria
F. None of the Above

14. _____ in human or animal wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms.
A. Microbes
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

15. _____ is a parasite that enters drinking water sources through sewage and animal waste. This parasite causes cryptosporidiosis.
A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Cryptosporidium
F. None of the Above

16. Giardia lamblia is a parasite that enters drinking water sources through sewage and animal waste. This parasite causes _____.
A. Fecal Coliform and E coli
B. Gastrointestinal illness
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

Bacteriological Monitoring Introduction

17. The routine microbiological analysis of drinking water is for _____, which is an indicator organism used to determine the biological quality of the water.
A. Indicator bacteria
B. Bacteria tests
C. Contamination
D. Coliform bacteria
E. Presence of an indicator
F. None of the Above

18. The presence of an indicator or _____ in drinking water is an important health concern because of the risk of waterborne diseases and illnesses.

A. Indicator bacteria
B. Pathogenic bacteria
C. Contaminate
D. Microbiological analysis
E. Presence of an indicator
F. None of the Above

19. If _____ are present, the water may be contaminated with fecal material and, therefore, pathogens.

A. Indicator bacteria
B. Pathogenic bacteria
C. Contaminates
D. Microbiological analysis
E. Presence of an indicator
F. None of the Above

20. Because it is difficult to test for specific disease-causing microorganisms, indicator bacteria are used to monitor for pathogens.

A. True B. False

21. _____ are usually harmless, occur in high densities, and are easily cultured.

A. Indicator bacteria
B. Bacteria tests
C. Contaminates
D. Microbiological analysis
E. Presence of an indicator
F. None of the Above

22. Commonly used indicators for routine monitoring of drinking water include total coliforms, fecal coliforms, and _____.

A. Sample container
B. Bacteria tests
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Iron bacteria
F. None of the Above

Bacteria Sampling

23. A sterile container must always be used to collect water samples for _____.

A. Indicator bacteria
B. Bacteria tests
C. Contamination
D. pH analysis
E. Presence of an indicator
F. None of the Above

24. Bacteria samples must be refrigerated and transported to the testing laboratory within 24 hours.

A. True B. False

25. A water test is not needed to identify _____. It forms an obvious reddish-brown slime on the inside of pipes and fixtures.

A. Colonies
B. Algae
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Iron bacteria
F. None of the Above

26. The presence of _____ in drinking water indicates that the water may be contaminated with disease-causing organisms.

A. Diseases
B. Germs
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Iron bacteria
F. None of the Above

Laboratory Procedures

27. One of four methods approved by the USEPA may be used by the laboratory to perform the _____.

A. Colilert
B. Coliform
C. Sample time
D. Total coliform analysis
E. Pathogen test
F. None of the Above

Methods

28. The MMO-MUG test, marketed as _____, is the most common method used for total coliform analysis.

A. Colilert
B. Coliform
C. Sample stuff
D. Total coliform analysis
E. Pathogen media
F. None of the Above

29. If coliforms are present, the laboratory will analyze the sample further for _____.

A. Colilert or E. coli
B. Coliforms or E. coli
C. Fecal coliforms or E. coli
D. Total coliform analysis or pathogens
E. Pathogens or total coliform analysis
F. None of the Above

Types of Water Samples

30. The type of _____ you are collecting must be properly identified on the laboratory form.

A. Colilert
B. Coliforms
C. Sample
D. Total coliform analysis
E. Pathogens
F. None of the Above

The three (3) types of samples are:

31. Repeat samples must be collected following a 'coliform present' routine sample. The number of repeat samples required is based on the number of _____ samples the water system normally collects.

A. Repeat
B. Special
C. QA QC
D. Total coliform analysis
E. Routine
F. None of the Above

32. A sample collected after repairs to the system and before it is placed back in operation is an example of a _____ sample.

A. Repeat
B. Special
C. Sample
D. Total coliform analysis
E. Routine
F. None of the Above

33. _____ samples are collected routinely in accordance with an approved sampling plan to monitor for contamination.

A. Repeat
B. Special
C. Sample
D. Total coliform analysis
E. Routine
F. None of the Above

Repeat Sampling

34. If a _____ is total coliform- or fecal coliform-positive, a set of repeat samples must be collected within 24 hours after being notified by the laboratory.

A. MCL compliance
B. Distribution system
C. Routine sample
D. Original sampling location
E. Repeat sample
F. None of the Above

The follow-up for repeat sampling is:

35. If a system collects only one _____ per month or quarter, it must collect four (4) repeat samples.

A. Special Sample
B. Routine sample
C. Repeat sample
D. Coliform present
E. Original sampling location
F. None of the Above

36. If a system collects two (2) or more routine samples per month, it must collect three (3) _____.

A. Compliance samples
B. Distribution samples
C. Routine samples
D. QA/QC Split
E. Repeat samples
F. None of the Above

37. One of the repeat samples must be collected from within five (5) service connections upstream from the _____.

A. MCL compliance
B. Distribution system
C. Routine sample
D. Original sampling location
E. Repeat sample
F. None of the Above

38. One of the repeat samples must be collected from within five (5) service connections downstream from the _____.

A. Special Sample
B. Routine sample
C. Repeat sample
D. Coliform present
E. Original sampling location
F. None of the Above

39. The _____ must be collected from the same sampling location over a four-day period, or on the same day, for water systems that have only one service connection.

A. Special Samples
B. Routine samples
C. Repeat samples
D. Coliform present
E. Original sampling location
F. None of the Above

40. The results of all _____ are included in the MCL compliance calculation.

A. Special Samples
B. Routine samples
C. Repeat samples
D. Coliform present
E. Original sampling location
F. None of the Above

Heterotrophic Plate Count HPC

41. Heterotrophic Plate Count (HPC) is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution.

A. True B. False

42. The term "_____" (CFU) refers to the chains, clusters, or single cells that form colonies of bacteria.

A. Coliform bacteria units
B. MCLs units
C. Standards
D. HPC units
E. Colony-forming units
F. None of the Above

Spread Plate Method

43. During the Spread Plate Method, all colonies are on the _____ where they can be distinguished readily from particles and bubbles.

A. Agar surface
B. Surface growth area
C. Top
D. Bottom
E. Material
F. None of the Above

44. During the Spread Plate Method, _____ can easily be discerned and compared to published descriptions.

A. Colony growth
B. Surface growth
C. Low counts
D. Heterotrophic organisms
E. Colony morphology
F. None of the Above

Membrane Filter Method

45. Large volumes of _____ can be tested by the Membrane Filter Method, and this method is preferred for low-count waters.

A. Colonies
B. Surface water
C. Low-turbidity water
D. Heterotrophic organisms
E. MCL
F. None of the Above

Heterotrophic Plate Count
(Spread Plate Method)

46. _____ use inorganic carbon sources as their substrate. The Heterotrophic Plate Count provides a technique to quantify the bacteriological activity of a sample.

A. Colonies
B. Surface growth
C. AGAR
D. Heterotrophic organisms
E. Autotrophic organisms
F. None of the Above

Total Coliforms

47. Compliance with the MCL for total coliforms is on a daily basis.

A. True B. False

48. For systems which collect fewer than _____ samples per month, no more than one sample per month may be total-coliform positive.

A. 5
B. 10
C. 100
D. 200
E. 40
F. None of the Above

49. For systems which collect _____ or more samples per month, no more than five (5) percent of the samples may be total-coliform positive.

A. 5
B. 10
C. 100
D. 200
E. 40
F. None of the Above

Acute Risk to Health (Fecal coliforms and E. coli)

50. If a routine analysis shows total coliform present, and a follow-up repeat analysis indicates fecal coliform or E. coli present, _____ has occurred.

A. A routine analysis violation
B. A drinking violation
C. A water penalty
D. An acute risk to human health violation
E. Fecal coliform or E. coli present
F. None of the Above

51. If routine analysis shows _____, and a follow-up repeat analysis indicates total coliform present, an acute risk to human health violation has occurred.

A. A routine analysis violation
B. A drinking violation
C. A MCL violation
D. Presence of bacteria
E. Total and fecal coliform or E. coli present
F. None of the Above

52. A water system is required to provide public notice via radio and television stations in the area when _____ occurs.

A. A routine analysis violation
B. A drinking water rule violation
C. A MCL violation
D. A human health violation
E. An acute health risk violation
F. None of the Above

53. A public notice for an acute health risk violation must be given as soon as possible, but no later than 24 hours after notification from the laboratory of the test results.

A. True B. False

54. A public notice must be issued by a water system whenever it fails to comply with an applicable MCL or _____.

A. Routine analysis
B. Drinking water rule
C. Treatment technique
D. Human health violation
E. Fecal coliform or E. coli present
F. None of the Above

55. Whenever a water system fails to comply with its monitoring and/or reporting requirements, a _____ is required.

A. Routine analysis
B. Drinking water rule
C. MCL violation
D. Public notice
E. Fecal coliform or E. coli present count
F. None of the Above

56. Each public notice must be issued properly and in a timely manner, and must contain certain information and _____.

A. Legal analysis
B. Drinking water rule information
C. NOVs
D. Mandatory language
E. Fecal language
F. None of the Above

57. The timing and place of posting of the public notice will depend on whether _____ is present to water users.

A. A routine analysis
B. A drinking water rule
C. An acute risk
D. Legal analysis
E. Fecal coliform or E. coli ~~present~~
F. None of the Above

The following are acute violations:

58. Violation of the _____ for nitrate is an acute violation.

A. Presence
B. MCL
C. MCLG
D. Count
E. Acute violations
F. None of the Above

59. Any violation of the _____ for total coliforms, when fecal coliforms or E. coli are present, is an acute violation.

A. Presence
B. MCL
C. MCLG
D. Count
E. Acute violations
F. None of the Above

60. Any outbreak of _____ is an acute violation.

A. Total coliforms
B. MCL
C. Waterborne disease
D. Radioactive bacteria
E. Acute violations
F. None of the Above

Waterborne Pathogen Section - Introduction

61. Pathogens are bacteria, viruses, and protozoans that cause disease.

A. True B. False

62. Pathogens _____ and affect people in a relatively short amount of time.

A. Limits the treatment process
B. Are mild in nature
C. Cause intestinal illness
D. Will cause fatalities
E. Limit the travel of pathogens
F. None of the Above

63. The _____ is the way waterborne pathogens are primarily spread.

A. Fecal-oral, or feces-to-mouth, route
B. Dermal to fecal route
C. Oral to fecal route
D. Influenza route
E. Waterborne mishaps
F. None of the Above

64. A source of waterborne pathogens is the stool of infected humans or animals. The stool contains the disease-causing bacteria, viruses, and _____.

A. Fecal Coliform and E coli
B. Protozoa
C. Microorganisms
D. Cryptosporidiosis
E. Bioslime
F. None of the Above

65. Another person must take the waterborne pathogen in through the mouth to become infected.

A. True B. False

66. _____ are different from the pathogens that cause influenza or the bacteria that cause tuberculosis.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Waterborne Pathogens
E. Coliform bacteria
F. None of the Above

67. _____ are spread through the air when an infected person coughs or sneezes.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Influenza virus and tuberculosis bacteria
E. Coliform bacteria
F. None of the Above

Chain of Transmission

68. If the source of feces in water is not infected with a _____, no disease will result.

A. Campylobacteriosis
B. Pathogen
C. Waterborne illness
D. Fecal-oral material
E. Contaminated water
F. None of the Above

69. How long pathogens survive in the water depends on the water temperature and the length of time the _____ are in the water.

A. Stomach bugs
B. Turbidity
C. Microscopic particles
D. Germs
E. Pathogens
F. None of the Above

70. Giardia and _____ are pathogens that may survive in water for months.

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Tampylobacteriosis
F. None of the Above

71. For disease to spread, the pathogens must enter the water system's intake, be inadequately treated, and the water must be consumed by a susceptible person.

A. True B. False

Bacterial Diseases

72. What is the most common diarrhea illness caused by bacteria?

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

73. _____ has most often been associated with food and un-chlorinated water.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Beaver fever
F. None of the Above

74. _____ can also cause "travelers' diarrhea."

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

75. Other diseases caused by bacteria in water are cholera, Legionellosis, salmonellosis, _____, and yersiniosis.

A. Shigellosis
B. Cysts
C. Hepatitis A
D. Campylobacteriosis
E. HIV
F. None of the Above

76. Chlorine kills or inactivates _____ in water.
A. Cysts
B. Cryptogiardia
C. Bacteria
D. Viral Plaques
E. Oocysts
F. None of the Above

77. _____ is a viral disease that may be spread through water.
A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

78. Chlorine inactivates most _____ in drinking water.
A. Illnesses
B. Giardiasis
C. Viruses
D. Pathogens
E. Infections
F. None of the Above

Sampling Procedures

79. Public Water Systems (PWS) are required by the Total Coliform Rule (TCR) to monitor their distribution systems for coliform bacteria in accordance with a written sample siting plan.
A. True B. False

80. In order to properly implement the sample siting plan, staff must understand the required sampling frequency and the _____ to be used for collecting the samples.
A. Multiple sources
B. Sample siting plan
C. Total coliform rule
D. Proper procedures and sampling containers
E. Laboratory containers
F. None of the Above

81. In order to properly implement the sample siting plan, staff must also understand the proper procedures for identification, storage and transport of the samples to the laboratory.
A. True B. False

Chain of Custody Procedures

82. A _____ begins when the sample containers are obtained from the laboratory. After that, a chain of custody record will accompany the sample containers.
A. Multiple source
B. Sample siting plan
C. Total coliform
D. Chain of custody record
E. Sampling container
F. None of the Above

83. In addition to a _____, each custody sample may require a seal.
A. Custody sample
B. Chain of custody record
C. Distribution system
D. Sample siting plan
E. Positive for total coliform
F. None of the Above

84. Since a sample may be used as physical evidence, _____ procedures are used to maintain and document sample possession.
A. Multiple sources
B. Sample siting plan
C. Total coliform
D. TCR
E. Chain of custody
F. None of the Above

85. Any time _____, both parties involved must sign, date, and note the time on the chain of custody record.
A. Multiple sources are used D. Samples transfer possession
B. The sample siting plan is used E. Sampling containers are lost
C. Total coliform is positive F. None of the Above

86. If a sample must be split and sent to more than one laboratory, a separate _____ is required for each part of the sample.
A. Form D. Sample siting plan
B. Chain of custody record E. Positive for total coliform
C. Shipping invoice F. None of the Above

87. The chain of custody record must be locked with the sealed samples inside sealed boxes if the samples are delivered to an after-hours night drop-off box.
A. True B. False

More on the Stage 2 DBP Rule

88. The Microbial and Disinfection Byproducts Rules (MDBPs) are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts. The _____ is one part of these rules.
A. Groundwater Rule (GWR) D. Total Coliform Rule
B. Compliance Rule E. ICR Rule
C. Stage 2 DBP Rule F. None of the Above

89. The _____ limits exposure to DBPs, specifically total trihalomethanes (TTHM) and five haloacetic acids (HAA5).
A. Disinfectant used D. LT2 Enhanced Surface Water Treatment Rule
B. DBP exposure E. Traditional disinfection practices
C. Stage 2 DBP Rule F. None of the Above

90. The Stage 2 DBP Rule applies to water systems that add a primary or residual disinfectant other than _____.
A. Ultraviolet (UV) light D. Chlorine
B. The open-channel system E. Chloramine
C. Ozone F. None of the Above

91. Amendments to the SDWA in 1996 required EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts (DBPs). The Stage 1 Disinfectants and Disinfection Byproducts Rule and the _____ were the first phase in a rulemaking strategy required by Congress.
A. Major public health advances D. Amendments to the SDWA in 1996
B. The Stage 2 DBPR E. Interim Enhanced Surface Water Treatment Rule
C. This final rule F. None of the Above

92. The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) builds upon the _____ to address more stringent protection measures for higher risk public water systems.
A. Stage 2 DBPR D. Long Term 2 Enhanced Surface Water Treatment Rule
B. DBP exposure E. Traditional disinfection practices
C. Stage 1 DBPR F. None of the Above

93. The _____ and the Long Term 2 Enhanced Surface Water Treatment Rule are the second phase of rules that address disinfectants/disinfection byproducts and microbial pathogens.

A. Major public health advances
B. The Stage 2 DBPR
C. Final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

94. The Stage 2 DBPR and the Long Term 2 Enhanced Surface Water Treatment Rule reduce protection against Cryptosporidium, and at the same time, increase potential health risks of DBPs.

A. True B. False

What is the Stage 2 DBPR?

95. The _____ will reduce the risk of cancer and reproductive and developmental health issues caused by disinfection byproducts (DBPs) in drinking water.

A. Stage 3 DBPR
B. DBP exposure
C. Stage 2 DBPR
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

96. The _____ tightens compliance monitoring requirements for trihalomethanes (TTHM) and haloacetic acids (HAA5).

A. Major public health advances
B. Stage 3 DBPR
C. Stage 2 DBPR
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

97. The _____ builds incrementally upon the Stage 1 DBPR to reduce DBP exposure and related health risks.

A. Stage 3 DBPR
B. Stage 2 DBPR
C. Stage 1 DBPR
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Stage 4 DBPR
F. None of the Above

98. The _____ and the Long Term 2 Enhanced Surface Water Treatment Rule are being promulgated at the same time to address concerns about risk tradeoffs between pathogens and DBPs.

A. Major public health advances
B. Stage 2 DBPR
C. Final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

What does the rule require?

99. The _____ will require systems to conduct an Initial Distribution System Evaluation (IDSE) to identify the locations with high disinfection byproduct concentrations.

A. Stage 2 DBPR
B. DBP exposure
C. Stage 1 DBPR
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

100. The locations with high DBP concentrations identified in the IDSE will be used by the systems as the sampling sites for Stage 2 DBPR compliance monitoring.

A. True B. False

101. Compliance with the maximum contaminant levels for TTHM and HAA5 will be calculated for each monitoring location in the distribution system. This approach is referred to as the _____.

A. TTHM and HAA5
B. DBP MCLs
C. Locational running annual average (LRAA)
D. Disinfection byproducts (DBPs)
E. Trihalomethanes and haloacetic acids
F. None of the Above

102. Each system has an operational evaluation level to provide early warning of possible future MCL violations.

A. True B. False

103. If an operational evaluation level is exceeded, the system is required to review its operational practices and identify actions that may be taken to mitigate future high _____.

A. TTHM5 and HTAA5
B. Halos
C. DBP levels
D. UV
E. Amounts of rainfall
F. None of the Above

Who must comply with the rule?

104. The _____ regulates community and nontransient noncommunity water systems that treat their water with a primary or residual disinfectant other than ultraviolet light.

A. DBPs from chlorination
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Total Coliform Rule
E. TTHM and HAA5
F. None of the Above

105. A public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents is called _____.

A. A nontransient non-community water system (NTNCWS)
B. A non-community water system
C. A community water system (CWS)
D. A trailer park
E. A nontransient water system
F. None of the Above

106. A water system that serves at least 25 of the same people more than six months of the year, but not as primary residence, such as schools, businesses, and day care facilities is called _____.

A. A Trailer park
B. A non-community water system
C. A community water system (CWS)
D. A nontransient non-community water system (NTNCWS)
E. A nontransient water system
F. None of the Above

What are Disinfection Byproducts (DBPs)?

107. _____ form when disinfectants used to treat drinking water react with naturally occurring materials in the water.

A. Disinfectants
B. DBLs
C. Humic
D. Disinfection byproducts (DBPs)
E. Sodium Thiosulfates
F. None of the Above

108. Total trihalomethanes and haloacetic acids are widely occurring _____ formed during disinfection with chlorine and chloramine.

A. Sodium Thiosulfates
B. Chloramines
C. Stage 2 DBPR
D. Classes of DBPs
E. Disinfectants
F. None of the Above

109. The amount of _____ can change daily, depending on the season, water temperature, amount of disinfectant added, and the amount of plant material in the water.

A. Thiols
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. Trihalomethanes and haloacetic acids
F. None of the Above

Are THMs and HAAs the only disinfection byproducts?

110. _____ act as indicators for DBP occurrence. They typically occur at higher levels than other known or unknown DBPs.

A. DBPs from chlorination
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. TTHM and HAA5
F. None of the Above

Microbial Regulations

111. The Surface Water Treatment Rule was implemented by USEPA to counter pathogens in drinking water.

A. True B. False

112. The Surface Water Treatment Rule regulates public water systems that use surface water, or groundwater under the direct influence of surface water, as their source.

A. True B. False

113. The Surface Water Treatment Rule requires regulated water systems to have sufficient treatment to reduce the source water concentration of Giardia and viruses by at least 99.9% and 99.99%, respectively.

A. True B. False

114. The _____ specifies treatment criteria that include turbidity limits, disinfectant residual, and disinfectant contact time conditions.

A. Long Term 1 Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Byproducts Rule
D. Surface Water Treatment Rule
E. IESW Rule
F. None of the Above

Water Quality Section Introduction- Chapter 2
SDWA- MCLs Introduction
Radionuclides

115. Certain radioactive minerals may emit a form of radiation known as alpha radiation.

A. True B. False

116. Some people who consume water containing _____ over many years may have an increased risk of getting cancer.

A. Radon gas
B. Beta/photon emitters
C. Radioactive mineral
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

117. _____ can be found in underground water sources, such as wells, and in the air in your home.

A. Radon gas
B. Beta/photon emitters
C. Radioactive material
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

118. _____ is added to drinking water to promote dental health.
A. Fluorine
B. Fluoride
C. Floc
D. Chlorine
E. Arsenic
F. None of the Above

119. The EPA standard for _____ in drinking water is 4 mg/L.
A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

Disinfection Rules - Stages 1 & 2 DBPR
Older Stage 1 DBPR Information

120. Disinfection byproducts that have been identified in drinking water include trihalomethanes, _____, bromate, and chlorite.
A. Cryptosporidium
B. Giardia
C. Haloacetic acids
D. Chlorine
E. Disinfection byproducts (DBPs)
F. None of the Above

121. The standards for disinfection byproducts in the _____ became effective in December 2001 for large surface water public water systems, and in December 2003 for small surface water and all ground water public water systems.
A. Cryptosporidium Rule
B. Disinfection Rule
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Stage 1 DBPR
F. None of the Above

122. When disinfectants used in water treatment plants react with bromide and/or natural organic matter in the source water, _____ are formed.
A. Cryptosporidium
B. Giardia
C. Chlorine byproducts
D. New regulations
E. Disinfection byproducts (DBPs)
F. None of the Above

123. Different types or amounts of _____ are produced by different disinfectants.
A. Cryptosporidium
B. Giardia
C. Chlorine byproducts
D. Regulations
E. Disinfection byproducts (DBPs)
F. None of the Above

124. Chloroform, bromodichloromethane, dibromochloromethane, and bromoform are _____. These chemicals form when chlorine or other disinfectants are used to control microbial contaminants in drinking water.
A. Trihalomethanes (THM)
B. Chlorites
C. Haloacetic Acids (HAA5)
D. Giardia and viruses
E. Disinfection Byproducts (DBPs)
F. None of the Above

125. Under the _____, total trihalomethanes (TTHM) are regulated at a maximum allowable annual average level of 80 ppb for large surface water public water systems.
A. Cryptosporidium Rule
B. Disinfection Rule
C. Old rules
D. New rules
E. Stage 1 DBPR
F. None of the Above

126. The regulated _____ are monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

A. Cryptosporidium
B. Trihalomethanes
C. Haloacetic Acids (HAA5)
D. Organic compounds
E. Maximum Contaminant Levels MCLs
F. None of the Above

Haloaecetic Acids (HAA5)

127. _____ is a disinfection byproduct that forms when ozone reacts with naturally occurring bromide in the source water.

A. Bromate
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

Koch's Postulates

128. An opportunistic pathogen has to invade a susceptible host for certain _____ to develop.

A. Diseases
B. Mutations
C. Carriers
D. Divide
E. Reproduction
F. None of the Above

129. Many _____, such as scurvy and rickets, are caused by dietary deficiencies.

A. Diseases
B. Mutations
C. Carriers
D. Pathogens
E. Microorganisms
F. None of the Above

130. Some _____ are very difficult to grow in the laboratory.

A. Diseases
B. Mutations
C. Carriers
D. Pathogens
E. Microbes
F. None of the Above

131. Cultures of human or animal cells can now be used to grow some of the fastidious organisms.

A. True B. False

132. All _____ do not affect all laboratory animals.

A. Pathogens
B. Secondary invaders
C. Microorganisms
D. Disease
E. Chemical reactions
F. None of the Above

133. _____ may cause diseases such as cancer of the lungs and skin.A. Environmental factors D. Disease

B. Secondary invaders
C. Microorganisms
E. Chemical reactions
F. None of the Above

Cell Metabolism

134. A cell's _____ includes all the chemical reactions by which food is transformed for use by the cell.

A. Fastidious
B. Metabolism
C. Chemical reactions
D. Germ theory of disease
E. Osmosis
F. None of the Above

135. A cell can respond to changes in its environment through its metabolism.
A. True B. False

Introduction to Bacteria
136. Bacteria are prokaryotes, and thus have no true nucleus.
A. True B. False

137. The _____ that some bacteria need to do photosynthesis is built into their cell membranes.
A. Chlorophyll
B. Organelle
C. Cellulose
D. Double-stranded DNA
E. Bacilli
F. None of the Above

138. Bacteria have only one _____.
A. Chloroplast
B. Organelle
C. Cellulose
D. Double-stranded DNA
E. Cell
F. None of the Above

139. There are some bacteria that can live in temperatures above the boiling point.
A. True B. False

Prokaryotes
140. The only prokaryotes are bacteria and archaea. All other life forms have cells with nuclei and are called _____.
A. Bacteria
B. Peptidoglycan
C. Bacilli
D. Eukaryotes
E. Microorganism
F. None of the Above

Early Origins
141. Bacilli bacteria are rod or stick-shaped. Cocci bacteria are shaped like little balls.
A. True B. False

142. Some bacterial cells cluster together to form _____.
A. An organism
B. An organelle
C. Cellulose
D. Pairs, chains, squares or other groupings
E. Helical or spiral in shape
F. None of the Above

143. The mitochondria are _____ that make energy for your body cells.
A. Chloroplasts
B. Organelles
C. Cellulose
D. Bacilli
E. Eukaryotes
F. None of the Above

144. There can be more than a billion (1,000,000,000) bacteria in a single teaspoon of topsoil.
A. True B. False

Peptidoglycan
145. Bacterial cell walls do not contain cellulose, but are made mostly of _____.
A. Capsule
B. Peptidoglycan
C. Cytoplasmic granules
D. Membrane/cytoplasmic membrane
E. True nucleus
F. None of the Above

146. Some antibiotics, like penicillin, stop bacteria from making _____, which keeps the bacteria from growing.
A. Disease(s)
B. Mutation(s)
C. Carriers
D. Peptidoglycan
E. Bacteria
F. None of the Above

147. If a person stops taking an antibiotic too soon, any living bacteria left could start growing and reproducing by making _____.
A. Bacteria
B. Peptidoglycan
C. Eukaryotes
D. Germ theory of disease
E. Microorganism
F. None of the Above

Bacterial Nutrition

148. Most cells require significant quantities of _____.
A. Water
B. Nitrogen
C. Iron, Zinc, Cobalt
D. Oxygen
E. Calcium
F. None of the Above

149. All life requires _____ to grow and reproduce.
A. Water
B. Copper
C. Iron, Zinc, Cobalt
D. Oxygen
E. Calcium
F. None of the Above

150. Some enzymes require the trace metals _____ to function.
A. Water and oxygen
B. Copper and iron
C. Iron, zinc, and cobalt
D. Oxygen and hydrogen
E. Calcium and zinc
F. None of the Above

151. Sources of energy required by all life include light or inorganic substances like sulfur, carbon monoxide or ammonia, or preformed organic matter like sugar, protein, and fats.
A. True B. False

152. The nutrient _____ may be in the form of nitrogen gas, ammonia, nitrate/nitrite, or a nitrogenous organic compound like protein or nucleic acid.
A. Water
B. Nitrogen
C. Iron, Zinc, Cobalt
D. Oxygen
E. Calcium
F. None of the Above

153. The nutrient _____ may be in the form of carbon dioxide, methane, carbon monoxide, or a complex organic material.
A. Water
B. Carbon
C. Iron, Zinc, Cobalt
D. Oxygen
E. Calcium
F. None of the Above

154. _____ in a bound form is used by all cells.
A. Water
B. DNA molecule
C. Iron, Zinc, Cobalt
D. Oxygen
E. Calcium
F. None of the Above

Fastidious

155. Many _____ can make the complex molecules they need from the basic minerals.

A. Eukaryotes
B. Bacteria
C. Prokaryotes
D. Centrioles
E. Viruses
F. None of the Above

156. Fastidious _____ require preformed organic molecules like vitamins, amino acids, nucleic acids, carbohydrates.

A. Eukaryotes
B. Bacteria
C. Prokaryotes
D. Centrioles
E. Viruses
F. None of the Above

Eukaryote Described

157. Eukaryotes have their genetic material organized into membrane-bound nuclei.

A. True B. False

158. _____ include multicellular organisms such as animals, plants, and fungi, as well as unicellular protists.

A. Eukaryotes
B. Bacteria
C. Prokaryotes
D. Centrioles
E. Viruses
F. None of the Above

159. _____ include other organisms such as bacteria which lack nuclei and other complex cell structures.

A. Eukaryotes
B. Bacteria
C. Prokaryotes
D. Centrioles
E. Viruses
F. None of the Above

160. The eukaryotes share a common origin, and are treated as a super kingdom, empire, or domain.

A. True B. False

Eukaryotic Cells

161. In terms of volume, eukaryotic cells are much larger than _____.

A. Eukaryotes
B. Bacteria
C. Prokaryotes
D. Centrioles
E. Viruses
F. None of the Above

162. _____ have a variety of organelles and a cytoskeleton composed of microtubules and microfilaments.

A. Eukaryotic cells
B. Bacteria
C. Prokaryotic cells
D. Centrioles
E. Viruses
F. None of the Above

163. DNA in _____ cells is divided into several bundles called chromosomes.

A. Eukaryotic
B. Bacteria
C. Prokaryotic
D. Centrioles
E. Viruses
F. None of the Above

164. Most eukaryotes have some process of reproduction via cell fusion.
A. True B. False

165. _____ include a variety of membrane-bound structures known as the endomembrane system.
A. Eukaryotic cells
B. Golgi bodies or dictyosomes
C. Prokaryotic cells
D. Centrioles
E. Viruses
F. None of the Above

166. _____ are simple compartments that can form by budding off of other membranes.
A. Eukaryotes
B. Bacteria
C. Vesicles or vacuoles
D. Centrioles
E. Viruses
F. None of the Above

167. Many cells ingest food through the process of osmosis.
A. True B. False

168. The _____ of a eukaryotic cell is surrounded by a double membrane, with pores that allow material to move in and out.
A. Nucleus
B. Flagella
C. DNA molecule
D. Cilia
E. Cell wall
F. None of the Above

169. The endoplasmic reticulum or ER of the nuclear membrane is involved in protein transport.
A. True B. False

170. The proteins synthesized by the nuclear membrane in most eukaryotes may be further modified in stacks of flattened vesicles, called Golgi bodies or dictyosome.
A. True B. False

Contractile Vacuoles

171. The _____ in protozoa collect and expel excess water.
A. Flagella
B. Contractile vacuoles
C. Vacuole or tonoplast
D. Free-living amoebae
E. Cell's cytoplasm
F. None of the Above

172. Hormones are often produced in vesicles in multicellular organisms.
A. True B. False

173. A central vacuole takes up most of a cell's volume in higher plants, which maintains the cell's _____.
A. Kinetosome or centriole
B. Vacuole or tonoplast
C. Osmotic pressure
D. Nonpathogenic protozoa
E. Various microtubular roots
F. None of the Above

174. Many _____ have slender motile projections that are called flagella when long and cilia when short.
A. Eukaryotes
B. Bacteria or viruses
C. Protozoa
D. Free-living amoebae
E. Centrioles
F. None of the Above

175. _____ are involved in movement, feeding, and sensation of the cell.
A. Eukaryotic flagella
B. Bacteria or viruses
C. Protozoa
D. Free-living amoebae
E. Centrioles
F. None of the Above

176. _____ and prokaryotic flagella are entirely distinct from each other.
A. Eukaryotic flagella
B. Bacteria or viruses
C. Protozoa
D. Free-living amoebae
E. Centrioles
F. None of the Above

177. The interior of flagella is continuous with the _____.
A. Flagella
B. Bacteria or viruses
C. Haptonema
D. Free-living amoebae
E. Cell's cytoplasm
F. None of the Above

Centrioles
178. Centrioles are often found in cells that do not have flagella. They generally occur in groups of one or two, called _____.
A. Kinetosome or centriole
B. Kinetids
C. Beneficial symbionts
D. Nonpathogenic protozoa
E. Various microtubular roots
F. None of the Above

179. Centrioles form a primary component of the _____.
A. Vacuole or tonoplast
B. Haptonema
C. Cyst
D. Cytoskeletal structure
E. Cytoplasm
F. None of the Above

180. _____ may form a spindle during nuclear division.
A. Contractile vacuoles
B. Centrioles
C. Paramecium
D. Microtubule-supported organelles
E. Vacuoles or tonoplasts
F. None of the Above

181. Radiolaria and heliozoa protists have various other microtubule-supported organelles.
A. True B. False

182. The protists _____ produce axopodia used in flotation or to capture prey.
A. Paramecium
B. Haptonema
C. Paramecium
D. Protozoan pathogens
E. Radiolaria and heliozoa
F. None of the Above

Gram Stain -Introduction

183. The two types of _____ have different amounts of peptidoglycan.

A. Bacteria
B. Peptidoglycan
C. Gram$^+$ or Gram$^-$
D. Bacterial cell walls
E. Gram stain
F. None of the Above

184. In the Gram process, the amount of peptidoglycan in the cell walls of the bacteria under study will determine their color when stained, thus identifying the bacterial cells as Gram$^+$ or Gram $^-$.

A. True B. False

185. Which type of bacteria stain a dark purple color because they have simpler cell walls with lots of peptidoglycan?

A. Aerobic
B. Positive
C. Gram$^+$ or Gram$^-$
D. Gram$^+$
E. Gram$^-$
F. None of the Above

186. Which type of bacteria stain a pinkish color because they have more complex cell walls with less peptidoglycan?

A. Positive
B. Fastidious
C. Gram$^+$ or Gram$^-$
D. Gram$^+$
E. Gram$^-$
F. None of the Above

187. Which type of bacteria often has toxic chemicals in their cell walls, and thus tend to cause more severe illness?

A. Positive
B. Fastidious
C. Gram$^+$ or Gram$^-$
D. Gram$^+$
E. Gram$^-$
F. None of the Above

188. Antibiotics are less effective against _____ bacteria, since these bacteria have less peptidoglycan in their cell walls.

A. Positive
B. Fastidious
C. Gram$^+$ or Gram$^-$
D. Gram$^+$
E. Gram$^-$
F. None of the Above

189. Pseudomonas aeruginosa is a _____ bacterium.

A. Positive
B. Fastidious
C. Gram$^+$ or Gram$^-$
D. Gram$^+$
E. Gram-negative
F. None of the Above

190. The Gram-stain appearance of pseudomonas aeruginosa is not particularly characteristic although rods are thinner than those of _____.

A. Coliform bacteria
B. Enteric-like bacteria
C. Standard plate count
D. HPC
E. CFU
F. None of the Above

Two types of cells- Procaryotes and Eucaryotes

Note: The text may use alternate spellings "Procaryotes and Eucaryotes" here.

191. A _____ doesn't have a complex system of membranes and organelles.

A. Prokaryotic cell
B. Enteric-like bacteria
C. Eukaryotic cell
D. HPC
E. CFU
F. None of the Above

192. A _____ has a complex structure, contains a true nucleus, and many organelles.

A. Eukaryotic cell
B. Vesicles
C. Prokaryotic cell
D. Protozoan
E. Paramecium
F. None of the Above

Structure of a Eukaryotic Cell

193. The cell membrane of a eukaryotic cell is composed of large molecules of proteins and _____.

A. Capsule
B. Cell wall
C. Cytoplasmic granules
D. Phospholipids
E. True nucleus
F. None of the Above

194. The _____ of a eukaryotic cell is selectively permeable.

A. Cytoplasmic granules
B. Cell membrane
C. Cell wall
D. A single circular DNA molecule
E. DNA and proteins
F. None of the Above

Nucleus

195. The _____ contains chromosomes that are characteristic of each species.

A. Chromosomes
B. Nucleus
C. Cell membrane
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

196. Each chromosome consists of many genes. A gene is a coiled unit made up of cytoplasmic granules.

A. True B. False

Cytoplasm

197. One of the cytoplasmic organelles found in cytoplasm is called _____,

A. Chromosomes
B. Prokaryotes
C. Cell membrane
D. Centrioles
E. Cytoplasmic organelles
F. None of the Above

Cell Wall

198. An external structure of plant cells, algae, and fungi is a _____.

A. Cytoplasmic granules
B. Cilia
C. Cell wall
D. A single circular DNA molecule
E. DNA and proteins
F. None of the Above

Cilia and Flagella

199. Some _____ cells have long and thin structures called flagella.

A. Eukaryotic
B. Vesicles
C. Prokaryotic
D. Protozoan
E. Paramecium
F. None of the Above

200. Flagella and _____ are organs of locomotion for eukaryotic cells.

A. Cytoplasmic granules
B. Cilia
C. A cell wall
D. Flagella
E. Hair
F. None of the Above

Structure of a Prokaryotic Cell

201. All bacteria are prokaryotes and they divide by binary fission.

A. True B. False

Chromosome

202. The chromosome of a prokaryotic cell serves as the control center of the bacterial cell. The chromosome usually consists of _____.

A. Cytoplasmic granules
B. Cilia
C. A cell wall
D. A single circular DNA molecule
E. DNA and proteins
F. None of the Above

203. A bacterial chromosome contains about 10,000 genes.

A. True B. False

Cytoplasm

204. _____ is a semi-liquid that surrounds the chromosome of a prokaryotic cell and is contained within the plasma membrane.

A. Chromosomes
B. Cytoplasm
C. Cell membrane
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

Cell Membrane

205. The cell membrane of a prokaryotic cell is similar to that of the _____.

A. Chromosomes
B. Prokaryotes
C. Eukaryotic cell
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

206. The _____ is very thin and controls the substances entering or leaving the cell.

A. Chromosomes
B. Prokaryotes
C. Prokaryotic cell membrane
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

Capsules

207. A highly organized layer of material outside the cell wall of some bacteria is called a _____.

A. Capsule
B. Cell wall
C. Cytoplasmic granules
D. DNA and proteins
E. True nucleus
F. None of the Above

208. A layer of material outside the cell wall of some bacteria that is not highly organized and not firmly attached to the cell wall is called a _____.

A. Capsule
B. Cell wall
C. Slime layer
D. DNA and proteins
E. True nucleus
F. None of the Above

209. _____consist of complex sugars combined with lipids and proteins.

A. Cytoplasmic granules
B. Cilia
C. A cell wall
D. Capsules
E. DNA and proteins
F. None of the Above

Flagella

210. Flagella are _____ that bacteria use to move.

A. Cytoplasmic granules
B. Cilia
C. Thread-like proteins
D. False feet
E. Hair
F. None of the Above

211. _____ are called motile while non-flagellated bacteria are called non-motile.

A. Bacteria
B. Peptidoglycan
C. $Gram^+$ or $Gram^-$
D. Flagellated bacteria
E. Microorganism
F. None of the Above

212. Peritrichous bacteria have _____.

A. One flagellum at each end
B. Tuft of flagella
C. The entire surface
D. Genetic material from one bacteria
E. Flagella over the entire surface
F. None of the Above

213. Lophotrichous bacteria have a _____ at one or both ends.

A. Forming spore
B. Spore formation
C. A single polar flagellum
D. Tuft of flagella
E. Cilia
F. None of the Above

214. Amphitrichous bacteria are bacteria that have _____.

A. One flagellum at each end
B. A single polar flagellum
C. The entire surface
D. Genetic material from another bacteria
E. One or both ends
F. None of the Above

215. Monotrichous bacteria are bacteria that have _____.

A. One flagellum at each end
B. A single polar flagellum
C. The entire surface
D. Genetic material from another bacteria
E. One or both ends
F. None of the Above

Pili or Fimbriae

216. Pili or Fimbriae on gram negative bacteria enable them to attach to other bacteria or to membrane surfaces such as _____.

A. Chromosomes
B. Intestinal linings or RBC
C. Cell membranes
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

217 Gram negative bacteria use _____ to transfer genetic material from one bacteria cell to another.

A. Chromosomes
B. Pili or Fimbriae
C. Cell membranes
D. Macromolecular polymer-peptidoglycan
E. Cytoplasmic organelles
F. None of the Above

Spores

218. Some bacteria enclose _____ in spores as a means of survival.

A. Spores
B. Genetic material
C. Cytoplasmic granules
D. Spore formation
E. Macromolecular polymer-peptidoglycan
F. None of the Above

219. When the _____ lands on a fertile surface, it forms a new vegetative cell.

A. Spores
B. Genetic material
C. Protein coat
D. Spore formation
E. Dried spore
F. None of the Above

220. Spore formation is not related to reproduction.

A. True B. False

Paramecium

221. _____ are single-celled organisms in the kingdom Protista that live in fresh water.

A. Kinetosome or centriole
B. E-coli
C. Paramecium
D. Eukaryotes
E. Bacterium Legionella pneumophila
F. None of the Above

222. The osmotic concentration in the external environment of paramecium is much lower than that in their _____.

A. Contractile vacuoles
B. Haptonema
C. Cyst
D. Protozoan pathogens
E. Cytoplasm
F. None of the Above

223. The habitat in which paramecium live is hypotonic to their cytoplasm.

A. True B. False

224. The continuous influx of water into Paramecium is caused by the difference in _____ concentration between their environment and cytoplasm.

A. Contractile vacuoles
B. Cytoplasm
C. Homeostasis
D. Osmotic
E. Hypotonic to their cytoplasm
F. None of the Above

225. Water in Paramecium must be continually pumped out of the cell at the same rate at which it moves in to maintain _____.

A. Life
B. Happiness
C. Homeostasis
D. Osmotic
E. Cytoplasm
F. None of the Above

226. The osmoregulation process in Paramecium is carried out by two organelles known as _____.

A. Contractile vacuoles
B. Cytoplasm
C. Homeostasis
D. Microtubule-supported organelles
E. Osmosis
F. None of the Above

Protozoa Section

227. The organisms that carry out all of their life functions within a single eukaryotic are called _____.

A. Eukaryotic cell
B. Protozoa
C. Amoeba
D. Marine ciliates
E. Cytoplasma
F. None of the Above

228. Paramecium, _____, and Amoeba are well-known examples of protozoa.

A. Eukaryotes
B. Enterovirulent E. coli
C. Marine ciliates
D. Euglena
E. Cytoplasma
F. None of the Above

229. Some _____ can be closely related to animals or plants, while others are relatively unique.

A. Eukaryotic cells
B. Protozoa
C. Amoebas
D. Marine ciliates
E. Cytoplasma
F. None of the Above

230. Another name for _____ is algae.

A. Eukaryotes
B. Enterovirulent E. coli
C. Amoebas
D. Marine ciliates
E. Unicellular photosynthetic protozoa
F. None of the Above

Free-living Protozoa

231. Many free-living _____ may be collected in similar microhabitats worldwide.

A. Eukaryotic cells
B. Protozoa
C. Amoebas
D. Marine ciliates
E. Cytoplasma
F. None of the Above

232. _____ live in the interstices of sediment and beach sands, surfaces, and in cold Antarctic environments.

A. Eukaryotes
B. Protozoa
C. Amoebas
D. Marine ciliates
E. Cytoplasma
F. None of the Above

233. _____ live in all moist habitats within the United States.

A. Eukaryotes
B. Protozoans
C. Amoebas
D. Marine ciliates
E. Cytoplasma
F. None of the Above

Amoebas

234. Amoebas are unicellular protists that can constantly change their shape.

A. True B. False

How does an amoeba locomote?

235. _____ locomote by movement of their cytoplasm.

A. Eukaryotes
B. Protozoa
C. Amoebas
D. Marine ciliates
E. E. coli
F. None of the Above

236. The _____ have false feet with which they 'flow' over a surface.

A. Eukaryotes
B. Protozoa
C. Amoebas
D. Marine ciliates
E. E. coli
F. None of the Above

237. The false feet of amoebas, called pseudopods, are also used to capture prey. They can detect the kind of prey and use different _____.

A. Eukaryotic cell
B. Protozoa
C. Amoebas
D. 'Engulfing tactics'
E. Cytoplasma
F. None of the Above

Protozoa Information

238. In freshwater protozoan communities, the specialized interstitial fauna of the sand found in marine communities is largely missing.

A. True B. False

239. _____ have been found in almost every type of soil and in every kind of environment, from peat bogs to the dry sands of deserts.

A. Foraminifera
B. Protozoan fauna
C. Soil-dwelling protozoa
D. Soil-loving amoeba
E. Microsporidia
F. None of the Above

240. The _____ exist in greater numbers in freshwater habitats than in marine habitats.

A. Foraminifera
B. Testate amoebae
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

Environmental Quality Indicators

241. A rich and characteristic _____ can often be found in polluted waters.

A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

Symbiotic Protozoa
Parasites

242. Parasitic species of protozoa are among the best-known protozoa.

A. True B. False

243. A unique group of obligate, intracellular parasitic protozoa is _____.

A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

244. _____ are diverse organisms that are capable of infecting a variety of plant, animal, and even other protist hosts.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

245. Worldwide infections in AIDS patients caused by four different genera of microsporidia (Encephalitozoon, Nosema, Pleistophora, and _____) have increased since 1985.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Enterocytozoon
E. Microsporidia
F. None of the Above

Protozoan Reservoirs of Disease

246. It is well known that bacteria can be present in the _____.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

247. The presence of viruses in the cytoplasm of _____ is less frequently reported.
A. Flagella
B. Bacteria or viruses
C. Protozoa
D. Free-living amoebae
E. Cell's cytoplasm
F. None of the Above

248. Certain human pathogens have been shown to not only survive but also to reproduce in the cytoplasm of free-living, _____.
A. Amoeba
B. Organisms
C. Beneficial symbionts
D. Nonpathogenic protozoa
E. Various protozoa
F. None of the Above

249. Protozoa are the natural habitat for certain pathogenic bacteria.
A. True B. False

250. The causative organism of Legionnaires' disease is _____.
A. Amoeba
B. Bacteria or viruses
C. Protozoa
D. Free-living amoebae
E. Bacterium Legionella pneumophila
F. None of the Above

251. _____ live and multiply in the cytoplasm of some free-living amoebae.
A. Centrioles
B. Viruses
C. Autotropic
D. Amoebae
E. Bacterium Legionella pneumophila
F. None of the Above

Symbionts

252. Some _____ can be beneficial symbionts.
A. Amoeba
B. Viruses
C. Protozoa
D. Free-living amoebae
E. Bacterium Legionella pneumophila
F. None of the Above

253. Many _____ inhabit the rumen and reticulum of ruminates and the cecum and colon of equids.

A. Protozoa
B. Foraminifera
C. Freshwater protozoa
D. Soil-dwelling protozoa
E. Ciliates
F. None of the Above

Data on Protozoa

254. Because of limited knowledge of free-living protozoa in the U.S. coastal waterways, most ecologists who include _____ in their studies of aquatic habitats do not identify them, even if they do count and measure them for biomass estimates.

A. Protozoa
B. Foraminifera
C. Freshwater protozoa
D. Fossil foraminifera
E. Marine protozoa
F. None of the Above

255. More is known about _____ of humans, domestic animals, and wildlife than about other free-living protozoans.

A. Protozoa
B. Foraminifera
C. Freshwater protozoa
D. Parasitic protozoa
E. Marine protozoa
F. None of the Above

Ecological Role of Protozoa

256. _____ play an important role in many communities where they occupy a range of trophic levels, although they are frequently overlooked,

A. Protozoa
B. Foraminifera
C. Freshwater protozoan
D. Fossil foraminifera
E. Marine protozoa
F. None of the Above

257. Protozoa are predators upon unicellular algae, _____, and microfungi.

A. Bacteria
B. Many ecological conditions
C. Amazingly diverse organisms
D. Pathogenic bacteria
E. Bacterium
F. None of the Above

258. _____ are a food source for microinvertebrates.

A. Meiofauna
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Protozoa
F. None of the Above

259. An important ecological role of protozoa is the transfer of bacterial and _____ to successive trophic levels.

A. Protozoa
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

Factors Affecting Growth and Distribution

260. _____ multiply by cell division.

A. Most free-living protozoa
B. Foraminifera
C. Freshwater protozoan
D. Fossil foraminifera
E. Marine protozoa
F. None of the Above

261 Protozoa can live actively in nutrient-poor to organically rich waters and in fresh water varying between 0º C (32º F) and 50º C (122º F).
A. True B. False

Wastewater Treatment Biology
262. In the activated sludge process, four (4) groups of bugs do most of the “eating”.
A. True B. False

263. The first group of bugs is the bacteria which eat the _____.
A. Dissolved organic compounds
B. Settled bugs
C. Activated sludge
D. Secondary treatment
E. Total Dissolved Solids
F. None of the Above

264. Microorganisms known as the free-swimming and _____ make up the second and third groups of bugs. These larger bugs eat the bacteria and are heavy enough to settle by gravity.
A. Mixed liquor
B. Suctoria
C. Stalked ciliates
D. Bacteria
E. Volatile Solids
E. None of the Above

265. The fourth group of bugs is a microorganism known as _____, which feed on the larger bugs and assist with settling.
A. Water bear
B. Suctoria
C. Activated sludge bugs
D. Rotifer
E. Vorticella
F. None of the Above

266. The bacteria that eat the dissolved organics have no mouth.
A. True B. False

267. The bacteria that eat the dissolved organics have a sticky fat layer on _____, which is what the organics adhere to.
A. Fur
B. Their feet
C. Their eyes
D. The outside of their body
E. Cilia
F. None of the Above

268. Once the bacteria have “contacted” their food, they start the digestion process by sending out a chemical enzyme through the cell wall to break up the _____.
A. Mixed liquor
B. Organic compounds
C. Activated sludge
D. Bacteria
E. Total Dissolved Solids
F. None of the Above

269. The digestion enzyme, known as the _____, breaks the organic molecules into units small enough to pass through the cell wall of the bacteria.
A. Mixed liquor
B. Hydrolytic enzyme
C. Activated sludge
D. Bacteria
E. Total Dissolved Solids
F. None of the Above

270. The _____ process in wastewater treatment uses bacteria-eating-bugs in the presence of oxygen to reduce the organics in water.

A. Mixed liquor
B. Oxidation
C. Activated sludge
D. Reduction
E. Settleable Solids
F. None of the Above

271. The contact of the bacteria with the organic compounds, the first step in the activated sludge process, takes about _____.

A. 24 hours
B. 2 Hours
C. 1 Hour
D. 30 Minutes
E. 72 Hours
F. None of the Above

272. The second step in the activated sludge process is the breaking up, ingestion and digestion processes, which takes _____.

A. Four (4) to 24 hours
B. 2 Hours
C. 1 Hour
D. 30 Minutes
E. 72 Hours
F. None of the Above

273. An asset to the settling process is the fat storage property of the bacteria.

A. True B. False

274. In the activated sludge process, the bugs “bump” into each other and their fat sticks together, causing flocculation of the _____.

A. Mixed liquor
B. Floc
C. Non-organic solids and biomass
D. WAS
E. Settleable Solids
F. None of the Above

275. The wastewater leaving the aeration tank, now called _____, flows to a secondary clarification basin where the flocculated biomass of solids settle out of the water.

A. Mixed liquor
B. Oxidation
C. Activated sludge
D. Reduction
E. Settleable Solids
F. None of the Above

276. The _____ (also called activated sludge) is used again by returning it to the influent of the aeration tank.

A. Carry over
B. RAS
C. Solids biomass
D. Super WAS
E. Sludge Volume Index
F. None of the Above

Wastewater Treatment Microlife

277. Euglypha is a shelled amoeba that primarily eats bacteria.

A. True B. False

278. Euchlanis is commonly found in activated sludge when effluent quality is bad.

A. True B. False

Escherichia Coli - Chapter 4
Fecal Coliform Bacteria

279. A microscopic organism that lives in the intestines of warm-blooded animals is _____.

A. Enrichment culture
B. Microscopic organisms
C. Fecal matter
D. Fecal coliform bacteria
E. Conditions are favorable for growth
F. None of the Above

280. If fecal coliform bacteria are present in high numbers in a water sample, it means that the water has been contaminated with _____.

A. Bacteria levels
B. Fecal coliform bacteria
C. Salmonellae
D. Bacterial concentrations
E. Fecal matter
F. None of the Above

281. Although _____ do not necessarily cause disease, they are indicators that other disease-carrying organisms may be present.

A. Enrichment culture
B. Microscopic organisms
C. Fecal matter
D. Fecal coliform bacteria
E. Conditions are favorable for growth
F. None of the Above

Reasons for Natural Variation

282. _____ are living organisms, unlike other drinking water quality parameters.

A. Bacteria levels
B. Fecal coliform bacteria
C. Salmonellae
D. Bacterial concentrations
E. Fecal matter
F. None of the Above

283. Fecal coliform counts are difficult to predict because _____ are dependent on specific conditions for growth that can change quickly.

A. Bacteria levels
B. Fecal coliform bacteria
C. Salmonellae
D. Bacterial concentrations
E. Fecal matter
F. None of the Above

284. Although winter rains may wash more _____ into a river or stream, cool water temperatures may cause a major die-off of fecal coliform bacteria.

A. Enrichment culture
B. Microscopic organisms
C. Fecal matter
D. Fecal coliform bacteria
E. Bacteria levels
F. None of the Above

Expected Impact of Pollution

285. Wastewater treatment plant discharges, failing septic systems and animal waste all contribute _____ to fresh water.

A. Enrichment culture
B. Microscopic organisms
C. Fecal matter
D. Fecal coliform bacteria
E. Conditions are favorable for growth
F. None of the Above

286. Urbanization does not necessarily decrease bacterial levels in a watershed because _____ are developed.

A. Bacteria levels
B. Fecal coliform bacteria
C. New sources of bacteria
D. Bacterial concentrations
E. Fecal matter
F. None of the Above

287. Surprisingly high _____ have been found in stormwater runoff in urbanized areas because other sources are present such as pets and leaking sanitary sewers.
A. Enrichment culture
B. Microscopic organisms
C. Fecal matter
D. Fecal coliform bacteria concentrations
E. Conditions are favorable for growth
F. None of the Above

Indicator Connection Varies
288. The microbiological quality of water can be assessed by measuring the levels of certain "_____" organisms such as general coliforms, E. coli, and Enterococcus bacteria.
A. Pathogen
B. General coliform
C. Fecal coliform
D. Enterococcus bacteria
E. Indicator
F. None of the Above

E. coli O157:H7
289. E. coli O157:H7 is found in human feces and causes _____ when consumed.
A. Shigella dysenteriae
B. Bacterium
C. Enterococcus bacteria
D. E. coli
E. Gastroenteritis
F. None of the Above

290. _____ has been identified as a cause of foodborne illness.
A. Preventive measures
B. Escherichia coli O157:H7
C. Enterovirulent E. coli
D. Gastroenteritis
E. Person-to-person contact
F. None of the Above

291. Illnesses caused by _____ have been associated with eating undercooked, contaminated ground beef.
A. Shigella dysenteriae
B. Bacterium
C. Most illnesses
D. E. coli
E. E. coli O157:H7
F. None of the Above

292. _____ can be spread by person-to-person contact in families and child care centers, consuming raw milk, or swimming in water contaminated with sewage.
A. Preventive measures
B. E. coli O157:H7
C. Enterovirulent E. coli
D. A cause of illness
E. Person-to-person contact
F. None of the Above

293. Infection from _____ can be prevented by thoroughly cooking ground beef, avoiding unpasteurized milk, and washing hands carefully.
A. Shigella dysenteriae
B. Bacterium
C. Most illnesses
D. E. coli
E. E. coli O157:H7
F. None of the Above

What is Escherichia coli O157:H7?
294. E. coli O157:H7 is one of hundreds of strains of the Enterococcus bacteria.
A. True B. False

295. A 1982 outbreak of severe bloody diarrhea was caused by hamburgers contaminated with E. coli O157:H7 bacteria.
A. True B. False

296. Types of E. coli bacteria are distinguished from each other using a combination of letters and numbers in the name of the bacterium.
A. True B. False

297. _____ in the EEC group cause gastroenteritis in humans.
A. Preventive measures
B. E. coli O157:H7
C. Enterovirulent E. coli
D. A cause of illness
E. Person-to-person contact
F. None of the Above

298. _____ normally inhabit the intestines of humans and animals. It is the dominant species found in feces.
A. Shigella dysenteriae
B. Bacterium
C. Most illnesses
D. E. coli bacteria
E. Giardia
F. None of the Above

How does the U.S. Environmental Protection regulate E. coli?
299. To comply with the Safe Drinking Water Act, public water systems are required by the EPA to monitor for _____.
A. Indicators
B. Five samples a month
C. Bacterial contamination
D. E. coli contamination
E. Coliform bacteria
F. None of the Above

300. If a water sample tests positive for total coliform, it must be further analyzed for _____.
A. Total coliform
B. Sanitary survey
C. Fecal coliform or E. coli
D. EPA regulations
E. Coliform bacteria
F. None of the Above

301. The largest public water systems must take at least 50 samples per month.
A. True B. False

302. Smaller water systems are required to take at least five samples per month.
A. True B. False

303. Typically, systems serving 25 to 1,000 people take one sample for coliform bacteria per month.
A. True B. False

304. Surface water sources are more vulnerable to bacterial contamination than groundwater systems.
A. True B. False

305. All surface water systems must disinfect their water to kill E. coli O157:H7.
A. True B. False

How is E. coli O157:H7 spread?
306. Meat can become contaminated which _____ during slaughter of cattle, and the organisms can be thoroughly mixed into beef when it is ground.
A. Giardia
B. Cryptosporidium
C. E. coli O157:H7 bacteria
D. Infected persons
E. Hemorrhagic colitis
F. None of the Above

307. _____ present on a cow's udders contaminate the raw milk.
A. Giardia
B. Cryptosporidium
C. E. coli O157:H7 bacteria
D. Infected persons
E. Hemorrhagic colitis
F. None of the Above

Giardiasis Giardia lamblia - Chapter 5

308. Giardia lamblia is a protozoa that moves with the aid of five flagella. In Europe, it is sometimes referred to as _____.
A. Chronic cases
B. The organism
C. Lamblia intestinalis
D. Typically, the disease
E. Morphologically distinct organism
F. None of the Above

309. The most frequent cause of non-bacterial diarrhea in North America is giardiasis.
A. True B. False

310. Giardiasis is caused by _____, a one-celled, microscopic parasite that can live in the intestines of animals and people.
A. Giardia duodenalis
B. Organisms
C. Parasites
D. Diseases
E. Morphologically distinct organisms
F. None of the Above

311. Giardia duodenalis is one of the most common causes of waterborne (and occasionally foodborne) illness often referred to as "Beaver Fever."
A. True B. False

312. Greasy diarrhea, gas, stomach cramps, fatigue, and weight loss begin approximately one week after ingestion of the _____.
A. Intestinal flora
B. Giardia cysts
C. Human giardiasis
D. Various degrees of symptoms
E. The microaerophilic Giardia
F. None of the Above

313. The basic biology of Giardia duodenalis, the _____ that causes giardiasis, is poorly understood.
A. Chronic case
B. Organism
C. Parasite
D. Disease
E. Morphologically distinct organism
F. None of the Above

314. The _____ uses mitosomes in the maturation of iron-sulfur proteins.
A. Intestinal flora
B. The disease mechanism
C. Human giardiasis
D. Various degrees of symptoms
E. Microaerophilic Giardia
F. None of the Above

Nature of Disease

315. _____ that cause human and animal illness appear to be identical.
A. Chronic cases
B. The organism
C. Lamblia intestinalis
D. Typically, the disease
E. Organisms
F. None of the Above

316. _____ may cause diarrhea within 1 week of ingestion of the cyst.
A. Intestinal flora
B. The disease mechanism
C. Human giardiasis
D. Various degrees of symptoms
E. The microaerophilic Giardia
F. None of the Above

317. Chronic cases of giardiasis, with and without defined _____, are difficult to treat.
A. Immune deficiencies
B. The organism
C. Lamblia intestinalis
D. Typically, the disease
E. Morphologically distinct organism
F. None of the Above

318. The _____ of giardiasis is unknown, though some investigators believe that the organism produces a toxin.
A. Intestinal flora
B. Disease mechanism
C. Human giardiasis
D. Various degrees of symptoms
E. Microaerophilic Giardia
F. None of the Above

319. _____ that causes giardiasis has been found inside host cells in the duodenum.
A. Intestinal flora
B. The organism
C. Lamblia intestinalis
D. Typically, the disease
E. Morphologically distinct organism
F. None of the Above

320. A possible pathogenic mechanism may be _____ of the absorptive surface of the intestine.
A. Intestinal flora
B. The disease mechanism
C. Human giardiasis
D. Various degrees of symptoms
E. Mechanical obstruction
F. None of the Above

321. _____ can be excysted, cultured, and encysted in the laboratory.
A. Intestinal flora
B. The organism
C. Lamblia intestinalis
D. Typically, the disease
E. Giardia
F. None of the Above

322. _____ have been described through analysis of their proteins and DNA.
A. Several strains of G. lamblia
B. Disease mechanisms
C. Human giardiasis
D. Various degrees of symptoms
E. The microaerophilic Giardia
F. None of the Above

323. The same strain of G. Lamblia will cause _____ in different individuals.
A. Intestinal flora
B. Disease mechanism
C. Human giardiasis
D. Various degrees of symptoms
E. Course of the disease
F. None of the Above

Diagnosis of Human Illness

324. Giardia lamblia is frequently diagnosed by visualizing the trophozoite or the cyst in stained preparations or unstained wet mounts with the aid of a microscope.
A. True B. False

325. In order to use a fluorescent antibody kit for staining, _____ may be concentrated by sedimentation or flotation.
A. Organisms
B. Infective cysts
C. Acute outbreaks
D. Giardiasis
E. Recognizable organisms in the sample
F. None of the Above

326. _____ that detects excretory secretory products of the organism may also be used to diagnose Giardia lamblia.
A. Bac-T
B. An enzyme
C. Lab array
D. Infective cysts
E. An enzyme linked immunosorbant assay (ELISA)
F. None of the Above

Relative Frequency of Disease

327. Since many individuals seem to have a lasting immunity after infection, _____ is more prevalent in children than in adults.
A. Cryptosporidium
B. An enzyme
C. Giardiasis
D. Infective cysts
E. Trophozoite
F. None of the Above

328. The overall incidence of _____ in the United States is estimated to be 2% of the population.
A. Cryptosporidium
B. An enzyme
C. Giardiasis
D. Infective cysts
E. Trophozoite
F. None of the Above

329. _____ of giardiasis are common with infants, not because of the water, but because of diaper changing hygiene procedures at childcare centers.
A. Flagyl
B. Infective cysts
C. Acute outbreaks
D. Giardiasis
E. Intestinal flora
F. None of the Above

330. The water provider is obligated to investigate and analyze all water customer complaints and make sure that the water is safe.
A. True B. False

Course of Disease and Complications

331. _____ is very effective in terminating infections.
A. Flagyl
B. Infective cysts
C. An acute outbreak
D. Giardiasis
E. Recognizable organisms in the sample
F. None of the Above

332. Giardiasis may shorten the lifespan of immune deficient individuals.
A. True B. False

Target Populations

333. _____ occurs throughout the population, but is more prevalent in children than adults.
A. This organism
B. An enzyme
C. Giardiasis
D. An Infective cyst
E. A small pear-shaped trophozoite
F. None of the Above

334. Adults are more likely to suffer from chronic symptomatic giardiasis than children.
A. True B. False

Cryptosporidiosis Cryptosporidium - Chapter 6
335. Cryptosporidiosis transmission occurs from ingestion of food or water contaminated with stool, such as water in the recreational water park and swimming pool settings.
A. True B. False

336. Watery diarrhea, severe cramps, weight loss, nausea, vomiting, and fever are all symptoms of cryptosporidiosis.
A. True B. False

337. The severity of cryptosporidiosis symptoms varies with the degree of underlying immunosuppression of the patient.
A. True B. False

338. Cryptosporidiosis is a danger for the immunocompromised, especially HIV-positive persons and persons with AIDS.
A. True B. False

339. Child care workers, diaper-aged children who attend childcare centers, persons exposed to human feces by sexual contact, and caregivers who might come in direct contact with feces all have an increased risk of contracting cryptosporidiosis.
A. True B. False

Cholera -Vibrio cholerae - Chapter 7
340. An organism called Vibrio Cholerae is the cause of cholera.
A. True B. False

341. V cholerae was discovered by Louis Pasteur in 1883.
A. True B. False

342. Cholera has been very common in industrialized nations for the last 100 years.
A. True B. False

343. Cholera cannot be easily prevented and treated.
A. True B. False

344. Cholera is not a major threat in the United States because of advanced water and sanitation systems.
A. True B. False

345. V cholerae is a comma-shaped, gram-negative aerobic bacillus.
A. True B. False

346. V cholerae O1 or O139 are associated with mild cholera outbreaks.
A. True B. False

347. Currently, El Leche is the predominant cholera pathogen.
A. True B. False

348. Cholera spreads rapidly in areas that have inadequate treatment of drinking water and sewage.
A. True B. False

Legionnaires' Disease - Legionella -Chapter 7
349. The bacteria that caused the 1976 outbreak of pneumonia at an American Legion convention came to be known as _____.
A. Legionella
B. Pontiac fever
C. Aerosolized water
D. Legionnaire's disease
E. Legionella pneumophila
F. None of the Above

350. The more severe form of the disease caused by Legionella bacteria is called Legionnaires' disease, and this infection includes pneumonia. The milder form of the disease is called _____.
A. Legionella
B. Pontiac fever
C. Legionnaires' disease
D. Pneumonia
E. Pneumophila
F. None of the Above

What have been the water sources for Legionnaires' disease?
351. The inhalation of small droplets of water or fine aerosol containing _____ is the most common cause of Legionnaires disease.
A. Legionella
B. Pontiac fever
C. Legionella bacteria
D. Legionnaire's disease
E. Legionella pneumophila
F. None of the Above

352. _____ are naturally found in rivers, lakes and ponds and may colonize manmade water systems such as air conditioning systems and cooling towers.
A. Legionella bacteria
B. Pontiac fever
C. Aerosolized water
D. Legionnaire's disease
E. Legionella pneumophila
F. None of the Above

How do people contract Legionella?
353. The most common way that Legionella bacteria enter into the lungs to cause pneumonia is through breathing.
A. True B. False

354. _____ can multiply rapidly in warm water-containing systems, from less than 10 per milliliter to over 1,000 per milliliter of water in a period of one month.
A. Legionella bacteria
B. Pontiac fever
C. Monoclonal antibodies
D. Legionnaire's disease
E. Pneumophila
F. None of the Above

355. A relatively simple procedure is available for disinfecting water systems when high numbers of _____ are found. This procedure uses chlorine and detergent.
A. Legionella bacteria
B. Pontiac fever
C. Monoclonal antibodies
D. Legionnaire's disease
E. Pneumophila
F. None of the Above

356. Which is the most common way that Legionella bacteria enter into the lungs to cause pneumonia?

A. Choking
B. Pontiac fever
C. Aspiration
D. Breathing
E. Coffee drinking
F. None of the Above

Epifluorescence Microscopy DFA Method

357. Routine biocide treatments will eradicate _____ in laboratory studies, but not in the environment.

A. Pontiac fever
B. Monoclonal antibodies
C. Legionella bacteria
D. Legionnaire's disease
E. Pneumophila
F. None of the Above

358. Culture methods aren't sensitive enough for routine, quantitative monitoring.

A. True B. False

359. Outbreaks of the disease can still be caused by _____ that culture methods will not identify.

A. Legionella
B. Bugs
C. Microbial mats
D. Legionnaire's disease
E. Non-culturable legionella
F. None of the Above

360. Direct fluorescent antibody (DFA) tests using a battery of _____ are more useful for routine monitoring than culture methods.

A. Legionella
B. Laboratory studies
C. Microbial mats
D. Legionnaire's disease
E. Monoclonal antibodies
F. None of the Above

361. Legionella species of bacteria are _____, strictly aerobic rods.

A. Legionella
B. Microbial mats
C. Gram negative
D. Legionnaire's disease
E. Legionella pneumophila
F. None of the Above

Related Diseases and Associated Illnesses Chapter 9

Amebic Meningoencephalitis -PAM - Naegleria fowleri

362. Primary Amebic Meningoencephalitis (PAM) is a common and usually deadly disease caused by infection with the ameba (a multi-celled organism that maintains the original shape).

A. True B. False

363. The incubation period for PAM is 2-15 days, after which severe meningitis-like symptoms suddenly start. As conditions worsen, the patient falls into a coma, and usually dies 3-7 days after the onset of symptoms.

A. True B. False

364. The PAM infection is caused by an ameba that lives in soil and in freshwater ponds, lakes, and rivers.

A. True B. False

365. PAM is very rare even though the ameba that causes the infection is commonly found in the environment.

A. True B. False

366. The ameba is believed to enter the body through the mouth and travel to the stomach. The disease is easily spread from person to person.
A. True B. False

367. The PAM disease is initially suspected based on patient history. The diagnosis is made through the examination of the fluid in the digestive tract or frequently before death through the examination of digestive lining.
A. True B. False

368. PAM is a mild illness that responds to routine treatments.
A. True B. False

Noroviruses Section
369. Noroviruses are a group of related viruses that cause acute gastroenteritis in humans.
A. True B. False

370. A person with a norovirus illness may experience a low-grade fever, chills, headache, muscle aches, and a general sense of tiredness.
A. True B. False

371. The “stomach flu” caused by norovirus infection is not related to the flu (or influenza), which is a respiratory illness caused by influenza virus.
A. True B. False

372. A person can become infected with norovirus by eating food or drinking liquids that are contaminated with the virus.
A. True B. False

373. Norovirus illnesses are very contagious and can spread rapidly through day-care centers or nursing homes.
A. True B. False

374. Persons who are infected with norovirus should not prepare food for at least 3 weeks after they recover from their illness.
A. True B. False

Virions
375. Individual viruses, also called _____, contain genetic material consisting of either DNA or RNA.
A. Podoviruses
B. Phage's host range
C. Myovirus bacteriophages
D. Phage lambda of E. coli
E. Virions
F. None of the Above

376. Viral DNA is double-stranded, while viral RNA is single stranded.
A. True B. False

377. The protective shell of a virus is called a capsid.
A. True B. False

Drinking Water Rules and Disease Relationship

378. The Total Coliform Rule (TCR) of 1989 and the _____ regulate microbial contamination of drinking water sources. The SWTR covers all water systems that use surface water or groundwater under the direct influence of surface water.
A. Long Term 1 Enhanced Surface Water Treatment Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Disinfectants/Disinfection Byproducts Rule
D. Surface Water Treatment Rule (SWTR) of 1989
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

379. The SWTR provides protection against Giardia intestinalis, viruses, and Legionella that can be present in surface water sources. The _____ provides additional protection against Cryptosporidium in surface water sources.
A. Long Term 1 Enhanced Surface Water Treatment Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Disinfectants/Disinfection Byproducts Rule
D. Surface Water Treatment Rule
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

380. Which rule regulates surface water systems that serve less than 10,000 persons?
A. Long Term 1 Enhanced Surface Water Treatment Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Disinfectants/Disinfection Byproducts Rule
D. Surface Water Treatment Rule
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

381. The LT1ESWTR was proposed along with the Filter Backwash Recycling Rule (FBRR).
A. True B. False

Chapter 10- Laboratory Analysis
Bacteriological Sample Processing - Procedures Section
Sample Procedures

382. The recommended method for detection of somatic and F-specific coliphage in streamwater samples is the single-agar layer (SAL), direct plating method with induction of β(beta)-galactosidase.
A. True B. False

383. In the SAL method, an agar medium, E. coli host culture, chemicals that induce the β(beta)-galactosidase enzyme, and appropriate antibiotics are mixed with 100-mL sample volumes.
A. True B. False

384. Upon infection by coliphage in the water sample, the E. coli host cells are lysed and stable dark blue indolyl product is visible within each plaque.
A. True B. False

385. Because of contamination by naturally occurring bacteria in streamwater samples, antibiotic-resistant host-culture strains are used as hosts for somatic and F-specific coliphage, respectively.
A. True B. False

386. For detection of coliphage in ground water, large sample volumes, such as 1-L volumes or greater, are recommended.
A. True B. False

387. The mCP agar method (U.S. Environmental Protection Agency, 1996c) is used to analyze samples for enumeration of _____.
A. Enteric viruses
B. Oocysts
C. Viral plaques
D. C. perfringens
E. E. coli host culture
F. None of the Above

388. Using standard MF techniques, _____ are incubated anaerobically for 24 hours at 44.5°C.
A. Oocysts
B. C. perfringens
C. The plates
D. Large sample volumes
E. Coliphage
F. None of the Above

389. After incubation and exposure of the plates to ammonium hydroxide, all straw-colored colonies that turn dark pink to magenta are counted as _____.
A. Enteric virus(es)
B. Oocyst(s)
C. Viral plaques
D. C. perfringens
E. E. coli host culture
F. None of the Above

390. Analyses for _____ are done with 100-, 30-, and 10-mL volumes of streamwater.
A. Oocysts
B. C. perfringens
C. The plates
D. Large sample volumes
E. Coliphage
F. None of the Above

391. The recommended method for detection of Cryptosporidium oocysts and Giardia cysts in water is Method 1623 (U.S. Environmental Protection Agency, 1999c).
A. True B. False

392. The _____ are separated from other particulates in the sample using Immunomagnetic Separation (IMS).
A. Oocysts
B. C. perfringens
C. The plates
D. Large sample volumes
E. Cryptosporidium oocysts and Giardia cysts
F. None of the Above

393. The final microscopic identification of _____ is made with fluorescently labeled antibodies and vital dye.
A. Enteric viruses
B. Pathogens
C. Viral plaques
D. Oocysts and cysts
E. E. coli host culture
F. None of the Above

394. The recommended methods for detection of _____ in water samples are the RT-PCR and cell-culture methods.

A. Enteric viruses
B. C. perfringens
C. The plates
D. Attached viruses
E. Coliphage
F. None of the Above

QA/QC Activities and Measures

395. QA/QC activities and measures, such as proper sterilization of sample bottles and other equipment, must be taken to reduce contamination.

A. True B. False

396. Prepare a separate set of E. coli host cultures for microbiological sampling at each site.

A. True B. False

Field personnel should do the following:

397. For every sample by field personnel for total coliform, E. coli, and enterococci analyses, a _____ must be prepared to determine the sterility of equipment and supplies.

A. Reagent water quality
B. Second sample
C. MF equipment blank
D. Protozoan
E. Microbiological sampling
F. None of the Above

398. For every fourth sample, a _____ must be prepared to measure the effectiveness of the analyst's rinsing technique or presence of incidental contamination of the buffered water.

A. Equipment blank
B. MF procedure blank
C. Sterile working surface
D. Laboratory
E. Procedure blank
F. None of the Above

399. Sample results are suspect if contamination is found from a MF equipment or _____ blank.

A. Reagent water quality
B. An environmental sample
C. MF equipment
D. Protozoan
E. MF procedure
F. None of the Above

400. _____ for coliphage, Cryptosporidium, Giardia, and enteric virus samples are different from the MF equipment blanks for bacterial analysis.

A. Equipment blanks
B. MF procedure blanks
C. Sterile working surfaces
D. Appropriate laboratory equipment
E. Laboratory procedures
F. None of the Above

401. _____ are different from equipment blanks in that they are generated under actual field conditions.

A. Reagent water qualities
B. Environmental samples
C. MF equipment blanks
D. Field blanks
E. Microbiological samples
F. None of the Above

Quality Assurance and Quality Control in the Laboratory

402. Production analytical laboratories may be evaluated using the following criteria: (1) appropriate and approved methods, (2) documented standard operating procedures, (3) approved quality-assurance plan, (4) fully documented quality control data, (5) participation in the standard reference sample project, (6) scientific capability of personnel, and (7) _____.

A. Equipment blanks
B. MF procedure blanks
C. Sterile working surfaces
D. Appropriate laboratory equipment
E. Prepare a MF procedure blank
F. None of the Above

403. Microbiology laboratories must follow good laboratory practices set forth by the American Public Health Association for cleanliness, safety practices, procedures for _____, and specifications for reagent water quality.

A. Reagent water quality
B. Environmental samples
C. MF equipment blanks
D. Media preparation
E. Microbiological sampling
F. None of the Above

Method 1623
Cryptosporidium and Giardia Analysis

404. Samples for cryptosporidium and giardia analysis are taken in accordance with USEPA Method 1623.

A. True B. False

405. Equipment used for collection of samples for _____ requires special sterilization procedures.

A. Total Organisms
B. Indicator bugs
C. Cholera, polio, typhoid, hepatitis
D. Oocysts
E. Cryptosporidium and Giardia
F. None of the Above

406. Method 1623 requires that sampling equipment be submerged in a vessel containing 12 percent hypochlorite solution for 30 minutes.

A. True B. False

407. After cleaning the sampling equipment in sodium hypochlorite solution, do not de-chlorinate the equipment using _____.

A. Dibromochloromethane
B. Bromoform
C. Cl_2 and HOCl
D. Sodium hypochlorite solution
E. Sodium thiosulfate
F. None of the Above

408. The sample for _____ analysis is composited in a cubitainer and sent to the laboratory.

A. Total Coliform (TC)
B. Indicator organisms
C. Cholera, polio, typhoid, hepatitis
D. Cryptosporidium
E. Giardia
F. None of the Above

409. The cryptosporidium sample does not have to be kept on ice during transport to the laboratory.

A. True B. False

Understanding Cryptosporidiosis

410. The transmission of _____ has increased dramatically over the past 20 years, making it an emerging parasitic protozoan pathogen.

A. Waterborne disease outbreaks
B. Cryptosporidium
C. Giardia lamblia
D. Parasitic protozoan pathogens
E. Emerging waterborne pathogens
F. None of the Above

411. Evidence suggests that _____ is spread in day-care centers, widely distributed water supplies, public pools, hospitals, and nursing homes.

A. Cryptosporidium
B. Chlorine-based disinfectant
C. Giardia lamblia
D. Parasitic protozoan pathogen
E. Emerging waterborne pathogen
F. None of the Above

412. Disease cause by _____ can be potentially life-threatening to immunocompromised patients

A. Cryptosporidium
B. Chlorine-based disinfectants
C. Giardia lamblia
D. Parasitic protozoan pathogens
E. Emerging waterborne pathogens
F. None of the Above

413. New drinking water regulations developed by EPA will reduce _____ and other resistant parasitic pathogens.

A. Cryptosporidium
B. MIB
C. Giardia lamblia
D. Parasitic protozoan pathogens
E. Emerging waterborne pathogens
F. None of the Above

414. The Long Term 2 Enhanced Surface Water Treatment Rule requires source water monitoring for _____.

A. Total Coliform (TC)
B. Indicator organisms
C. Cholera, polio, typhoid, hepatitis
D. Cryptosporidium
E. Giardia
F. None of the Above

415. Alternative disinfection methods, such as ozone, UV, or chlorine dioxide, may be adopted by systems with high concentrations of _____ in their source water.

A. Cryptosporidium
B. Beaver fever
C. Giardia lamblia
D. Emerging parasitic protozoan pathogens
E. Emerging waterborne pathogens
F. None of the Above

416. Water systems must continue to maintain residual levels of _____ in their distribution systems, regardless of the primary disinfection method used.

A. High-test calcium hypochlorites
B. Calcium hypochlorite tablets
C. Hypochlorous acid
D. Chlorine-based disinfectants
E. Chlorine dioxide
F. None of the Above

Understanding Giardia lamblia

417. Another emerging waterborne pathogen that can be transmitted to humans through drinking water that might otherwise be considered pristine is _____.

A. Cryptosporidium
B. Water bear
C. Giardia lamblia
D. An emerging parasitic protozoan pathogen
E. Emerging waterborne pathogen
F. None of the Above

418. All warm-blooded animals are known to carry _____, with beaver being a prime source for its transmission to water supplies.

A. Cryptosporidium
B. Chlorine-based disinfectants
C. Giardia lamblia
D. New pathogens
E. Emerging waterborne pathogens
F. None of the Above

Chlorination Section – Chapter 11

Pathophysiology

419. As far as chlorine safety and respiratory protection, the intermediate _____of chlorine accounts for its effect on the upper airway and the lower respiratory tract.

A. Generation of free oxygen radicals
B. Vapor from Chlorine gas
C. Effects of Hydrochloric acid
D. Water solubility
E. The odor threshold for chlorine
F. None of the Above

420. Because chlorine gas is so dangerous, the odor threshold for chlorine is approximately _____; however, distinguishing toxic air levels from permissible air levels may be difficult until irritative symptoms are present.

A. 1 parts per million (ppm)
B. 3 parts per million (ppm)
C. 10 parts per million (ppm)
D. 3-5 parts per million (ppm)
E. 0.3-0.5 parts per million (ppm)
F. None of the Above

Mechanism of Activity

421. The mechanisms of cellular injury are believed to result from the oxidation of functional groups in cell components, from reactions with tissue water to form_____, and from the generation of free oxygen radicals.

A. Generation of free oxygen radicals
B. Chlorine acid
C. Hydrochloric acid
D. A caustic effect
E. Hypochlorous and hydrochloric acid
F. None of the Above

Solubility Effects

422. _____ is highly soluble in water. The predominant targets of the acid are the epithelia of the ocular conjunctivae and upper respiratory mucus membranes.

A. Hydrochloric acid
B. H_2SO_4
C. Hypchloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

Pathological Findings

423. Chlorine gas is the most expensive form of chlorine to use. The typical amount of chlorine gas required for water treatment is 1-16 mg/L of water.

A. True B. False

424. Different amounts of chlorine gas are used depending on the quality of water that needs to be treated. If the water quality is good, a higher concentration of chlorine gas will be required to disinfect the water if the contact time cannot be increased.

A. True B. False

Chemistry of Chlorination

425. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid , about 100 times less effective.

A. True B. False

426. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the _____increases.
A. Reduction Ratio D. "CT" disinfection concept
B. CT actual E. Ratio of hypochlorous acid
C. Free chlorine residual F. None of the Above

427. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.
A. True B. False

428. Temperature plays a small part in the acid ratio. Although the ratio of _____is greater at lower temperatures, pathogenic organisms are actually harder to kill.
A. Hypochlorous acid D. Total chlorine
B. The amount of chlorine E. pH value and temperature
C. Chlorine Demand F. None of the Above

429. If all other things were equal, _____ and a lower pH are more conducive to chlorine disinfection.
A. Lower pH D. Lower water temperature
B. Hypochlorous acid E. The hypochlorite ion
C. Higher water temperatures F. None of the Above

430. The disassociation of chlorine gas
(OCl -): HOCl $H^+ + OCl^-$ Also expressed HOCl $\rightarrow H^+ + OCl-$
(hypochlorous acid) (hydrogen) (hypochlorite ion)
A. True B. False

431. All three forms of chlorine produce sodium hypochlorite when added to water.
A. True B. False

432. Hypochlorous acid is a strong acid but a weak disinfecting agent. The amount of hypochlorous acid depends on the pH and temperature of the water.
A. True B. False

Types of Residual
433. _____ is all chlorine that is available for disinfection.
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine
C. Free chlorine F. None of the Above

434. Total chlorine residual = free +_____.
A. Chlorine residual D. Combined chlorine residual
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

435. In water, there are always other substances (interfering agents) such as iron, manganese, turbidity, etc., which will combine chemically with the chlorine. This is called the _____.

A. Chlorine residual
B. Chlorine demand
C. Pathogen reduction
D. Break-point chlorination
E. Total chlorine residual
F. None of the Above

436. According to the text, once chlorine molecules are combined with these interfering agents, they are not capable of disinfection. _____ is much more effective as a disinfecting agent.

A. Chlorine residual
B. Chlorine demand
C. Free chlorine
D. Break-point chlorination
E. Total chlorine residual
F. None of the Above

437. Either a total or a _____can be read when a chlorine residual test is taken,

A. Chlorine residual
B. Chlorine demand
C. Free chlorine residual
D. Break-point chlorination
E. Total chlorine residual
F. None of the Above

438. _____ is a much stronger disinfecting agent. Therefore, most water regulating agencies will require that your daily chlorine residual readings be of free chlorine residual.

A. Free chlorine
B. Total residual
C. Free chlorine residual
D. "CT" disinfection concept
E. T10 of the process unit
F. None of the Above

439. _____ is where the chlorine demand has been satisfied, and any additional chlorine will be considered free chlorine.

A. Chlorine residual
B. Chlorine demand
C. Free chlorine
D. Break-point chlorination
E. Total chlorine residual
F. None of the Above

Residual Concentration/Contact Time (CT) Requirements

440. Since monitoring for very low levels of pathogens in treated water is analytically very difficult, utilizing the _____ is recommended to demonstrate satisfactory treatment.

A. Free chlorine
B. Total residual
C. Free chlorine residual
D. "CT" disinfection concept
E. T10 of the process unit
F. None of the Above

441. _____ = Concentration (mg/L) x Time (minutes)

A. CT
B. The amount of chlorine
C. Chlorine Demand
D. Total chlorine
E. pH value and temperature
F. None of the Above

442. The effective reduction in pathogens can be calculated by reference to standard tables of required _____.

A. Free chlorine
B. Total residual
C. Free chlorine residual
D. "CT" s
E. T10 of the process unit
F. None of the Above

443. The CT concept as developed by the United States Environmental Protection Agency (uses the combination of disinfectant residual concentration (mg/L) and the effective disinfection contact time (in minutes) to measure effective pathogen reduction.
A. True B. False

Calculation and Reporting of CT Data
444. Reduction Ratio should be reported, along with the appropriate pH, temperature, and _____.
A. Reduction Ratio D. Disinfectant residual
B. CT actual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

445. The _____ must be greater than 1.0 to be acceptable.
A. Reduction Ratio D. "CT" disinfection concept
B. CT actual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

446. You can also calculate and record actual log reductions. Reduction Ratio = CT actual divide by _____.
A. Reduction Ratio D. "CT" disinfection concept
B. CT E. CT required
C. Free chlorine residual F. None of the Above

447. Which missing term shall be calculated daily, using either the maximum hourly flow and the disinfectant residual at the same time, or by using the lowest CT value if it is calculated more frequently?
A. Free chlorine D. "CT" disinfection concept
B. Total residual E. Disinfection CT values
C. Free chlorine residual F. None of the Above

Chlorine Exposure Limits Review
448. The OSHA PEL (Permissible Exposure Limit) for chlorine is _____.
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

449. Chlorine gas is about _____ times heavier than air.
A. 1.5 D. 2.5
B. 1.0 E. 3.0
C. 0.5 F. None of the Above

450. The IDLH (Immediately Dangerous to Life and Health) value for chlorine is _____.
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

451. The Fatal Exposure Limit for chlorine is _____.
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

452. A worker's exposure to chlorine shall at no time exceed the OSHA PEL.
A. True B. False

453. Only use chlorine gas in a well-ventilated area so that _____ cannot concentrate.
A. Chlorine exposure
B. The connection
C. The leak area
D. Any leaking gas
E. Several safety precautions
F. None of the Above

454. When chlorine is added to water, _____ (HOCl) and the hypochlorite ion (OCL^-) are formed.
A. Cl_2
B. Hypochlorous acid
C. Hypochlorite ion
D. Combined Available Chlorine, Total
E. Monochloramine, Cl2
F. None of the Above

455. The chemical equation that best describes the reaction when _____ is added to water is: $Cl_2 + H_2O$ --> H+ + Cl- + HOCl.
A. Chlorine gas
B. Cl
C. HOCl and OCl-
D. Combined Available Chlorine
E. Monochloramine
F. None of the Above

Understanding Disinfection
Wastewater Disinfection
456. Several chemicals and process are used to _____, but none are universally applicable.
A. Limit the effects of organic material
B. Improve water quality
C. Control residual disinfection
D. Disinfect wastewater
E. Limit the travel of pathogens
F. None of the Above

457. Aerobic treatment processes do not reduce pathogens enough to qualify as _____.
A. Treatment techniques
B. Disinfection processes
C. Environmentally safe
D. Primary methods
E. Economical
F. None of the Above

458. Chlorination/dechlorination, ozonation, and UV light are methods used for _____.
A. Disinfection of wastewater
B. Water quality
C. Environmental and regulatory impact
D. Primary methods
E. Economical and versatile chemicals
F. None of the Above

Water Disinfection
459. The final stage in the _____ is usually disinfection, which limits the effects of organic material, suspended solids and other contaminants.
A. Effects of organic material
B. Alternative disinfection processes
C. Residual level of disinfection
D. Water treatment process
E. Travel of pathogens
F. None of the Above

460. The primary methods used for the _____ in small water systems are ozone, ultraviolet irradiation (UV), and chlorine.
A. Chlorates are powerful oxidizers
B. Adverse health effects
C. Disinfection of water
D. Microbiological contamination
E. Sodium chloride
F. None of the Above

461. There are _____ used by small water systems, including chlorine dioxide, potassium permanganate, chloramines, and peroxone.
A. Many ways to remove organic material
B. Numerous alternative disinfection processes
C. Residual levels of disinfection
D. Additional killing mechanisms
E. Pathogens
F. None of the Above

462. Surface water sources were initially the focus of _____, but the Amendments to the Safe Drinking Water Act in 1996 mandated the development of regulations for the disinfection of groundwater.
A. Chlorates are powerful oxidizers
B. Adverse health effects
C. Water disinfection regulations
D. Microbiological contamination
E. Sodium chloride
F. None of the Above

463. "Chlorate" can refer to chemical compounds containing the _____ (ClO_3^-).
A. Acid/base balance
B. Stable perchlorates
C. Chlorate anion
D. Traditional structures
E. Chemical formula $CaCl_2$
F. None of the Above

464. Because _____ are powerful oxidizers, they should be kept away from easily oxidized materials.
A. Chlorates
B. Adverse health effects
C. Formula ClO_3^-
D. Microbiological contamination
E. Sodium chlorides
F. None of the Above

465. The instability of chlorates has reduced their use in _____. More stable perchlorates are used instead.
A. Acid/base balance
B. Stable perchlorates
C. Formula ClO_3^-
D. Pyrotechnics
E. Chemical formula $CaCl_2$
F. None of the Above

Chloride Ion

466. The chloride ion Cl^- is formed when the _____ gains an electron.
A. Chlorate compound
B. Adverse health effects
C. Element chlorine
D. Microbiological contamination
E. Sodium chloride molecule
F. None of the Above

467. The salts of the chloride ion, such as sodium chloride, are _____.
A. Acid/base balance
B. The stable perchlorates
C. The formula ClO_3^-
D. Very soluble in water
E. The chemical formula $CaCl_2$
F. None of the Above

468. Methyl chloride (chloromethane) is _____ which does not contain a chloride ion.
A. Chlorates are powerful oxidizers
B. Adverse health effects
C. The chloride ion
D. An organic covalently bonded compound
E. Sodium chloride
F. None of the Above

469. Salts formed from chloride, such as sodium chloride, calcium chloride, magnesium chloride, and potassium chloride, have various uses in food preservation, medical treatments, and _____.

A. $CaCl_2$
B. Cement formation
C. ClO_2^-
D. Corresponding anions Cl^-, ClO^-, ClO_2^-, ClO_3^-, or ClO_4
E. Chlorine dioxide
F. None of the Above

470. The chemical formula for sodium chloride, also known as table salt, is _____.

A. $CaCl_2$
B. NaCl
C. ClO_2^-.
D. Cl^-, ClO^-, ClO_2^-, ClO_3^-, or ClO_4
E. $NACl_2$
F. None of the Above

471. Calcium chloride is a salt that is sold in pellet form for removal of dampness from rooms.

A. True B. False

472. The compound _____ is also used to maintain unpaved roads, fortify road bases, and de-ice roads.

A. Potassium chloride
B. Calcium chloride
C. Chlorite ion
D. Corresponding anions Cl^-, ClO^-, ClO_2^-, ClO_3^-, or ClO_4
E. Chlorine dioxide
F. None of the Above

473. The _____ are a closely monitored constituent of the mud system in the petroleum industry.

A. Salts
B. Mudballs
C. Chlorite ions
D. Chlorides
E. Chlorine dioxide
F. None of the Above

474. _____ is also a useful indicator of fecal contamination in river/groundwater.

A. Potassium chloride
B. Chloride
C. Calcium chloride
D. Magnesium chloride
E. Chlorine dioxide
F. None of the Above

Chlorite Ion

475. The formula for chlorite ion is _____.

A. $CaCl_2$
B. Cl-
C. ClO_2^-
D. ClO^-
E. ClO_3^-
F. None of the Above

476. A chlorite is a compound that contains the chlorite ion ClO_2^-, with chlorine in oxidation state +3,

A. True B. False

477. Chlorine is seen in an oxidation state of +4 in the neutral compound _____.

A. Calcium chloride
B. Sodium chloride
C. Magnesium chloride
D. Potassium chloride
E. Chlorine dioxide ClO_2
F. None of the Above

Understanding Commonly Used Water Disinfectants

478. Some type of chlorine-based process is used by almost all U.S. water systems that disinfect their water. Chlorine is either used alone or in combination with?

A. Other disinfectants
B. Residual disinfectant
C. Chemical compounds
D. Disease-causing organisms
E. Slime bacteria
F. None of the Above

479. Chlorination offers other benefits in addition to controlling disease-causing organisms. As an example, chlorination reduces many _____.

A. Other disinfectants
B. Residual disinfectants
C. Chemical compounds
D. Customer Complaints
E. Disagreeable tastes and odors
F. None of the Above

480. Another benefit is that chlorination eliminates _____ that commonly grow in reservoirs, water mains, and storage tanks.

A. Color
B. Residual disinfectants
C. Chemical compounds
D. Disease-causing organisms
E. Slime bacteria, molds and algae
F. None of the Above

481. Another benefit is that chlorination removes chemical compounds that have unpleasant tastes and _____.

A. Combination with other disinfectants
B. Residual disinfectant
C. Removes chemical compounds
D. Disease-causing organisms
E. Hinder disinfection
F. None of the Above

482. Another benefit is that chlorination helps remove _____ from the raw water supply.

A. Turbidity
B. Residual disinfectant
C. Iron and manganese
D. Disease-causing organisms
E. Slime bacteria
F. None of the Above

483. Chlorine-based chemicals provide "_____" levels that prevent microbial re-growth in the water distribution system.

A. Combination with other disinfectant
B. Residual disinfectant
C. Static
D. Contact time
E. Safe
F. None of the Above

The Risks of Waterborne Disease

484. E. coli can cause deadly outbreaks of waterborne disease with inadequate or no disinfection of the drinking water.

A. True B. False

485. _____ is an emerging pathogen that is resistant to chlorination. It can appear even in high quality water sources.

A. Total Coliform (TC)
B. Indicator organisms
C. Cholera, polio, typhoid, hepatitis
D. Cryptosporidium
E. Giardia
F. None of the Above

The Benefits of Chlorine
Potent Germicide
486. Chlorine is a potent disinfectant that is added to drinking water to destroy?
A. Cryptosporidium parvum and Giardia lamblia
B. Pathogenic organisms
C. Nitrogenous compounds
D. Sodium hypochlorite solution
E. Chlorine disinfectants
F. None of the Above

487. There are several forms of chlorine disinfectants: _____, sodium hypochlorite solution (bleach), and dry calcium hypochlorite.
A. Cryptosporidium parvum and Giardia lamblia
B. Many disease-causing microorganisms
C. Elemental chlorine (chlorine gas)
D. Sodium hypochlorite solution
E. Chlorine disinfectants
F. None of the Above

488. Each form of chlorine disinfectant has distinct advantages and limitations for _____.
A. Cryptosporidium parvum and Giardia lamblia
B. Many disease-causing microorganisms
C. Particular applications
D. Sodium hypochlorite solution
E. Chlorine disinfectants
F. None of the Above

Taste and Odor Control
489. Chlorine disinfectants reduce many tastes and odors by oxidizing naturally occurring substances such as _____, sulfides, and decaying vegetation.
A. Cryptosporidium parvum and Giardia lamblia
B. Many disease-causing microorganisms
C. Nitrogenous compounds
D. Sodium hypochlorite solution
E. Algae secretions
F. None of the Above

Biological Growth Control
490. Chlorine disinfectants remove _____ that commonly grow in reservoirs, on the walls of water mains, and in storage tanks.
A. Cryptosporidium parvum and Giardia lamblia
B. Many disease-causing microorganisms
C. Nitrogenous compounds
D. Slime bacteria, molds and algae
E. Chlorine disinfectants
F. None of the Above

Chemical Control
491. Chlorine disinfectants remove ammonia and other _____ that hinder disinfection.
A. Cryptosporidium parvum and Giardia lamblia
B. Disease-causing microorganisms
C. Nitrogenous compounds
D. Hydrogen sulfides
E. Chlorine disinfectants
F. None of the Above

Water Treatment
492. In addition to producing a disinfected and chemically safe product, other objectives of water treatment include: no objectionable taste or odor; low levels of color and turbidity; and chemical stability.
A. True B. False

493. Surface water is more challenging to treat than groundwater, which is naturally filtered as it percolates through sediments.
A. True B. False

494. Surface water has a heavy load of organics and minerals, and may harbor Cryptosporidium parvum and Giardia lamblia.
A. True B. False

Water Distribution
495. After it leaves the treatment facility, drinking water must be kept safe from microbial contamination in storage and distribution. A pre-determined chlorine concentration is designed to remain in treated water to provide this protection. This is known as chlorine residual.
A. True B. False

496. A significant intrusion of pathogens may result from a broken water main. The level of the average chlorine residual should still be sufficient to disinfect contaminated water.
A. True B. False

The Challenge of Disinfection Byproducts
497. While disinfection of water is the top priority, water systems must also control disinfection byproducts (DBPs).
A. True B. False

498. The available evidence proves that DBPs in drinking water cause adverse health effects in humans.
A. True B. False

Understanding Disinfection Byproducts (DBPS)
499. Public water systems have widely used _____, along with filtration, to remove microbial pathogens in drinking water.
A. Chlorates
B. UV
C. THMs and HAAs
D. Ozone
E. Chlorine and other chemical disinfectants
F. None of the Above

500. Natural organic matter (NOM) in the source water affects the levels of DBPs that form.
A. True B. False